



National Aeronautics and
Space Administration

Budget Estimates

FISCAL YEAR 1985

Volume II

Construction of Facilities

LIBRARY

National Aeronautics and Space Administration
Washington, D.C. 20546

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

GENERAL STATEMENT

The Construction of Facilities (CoF) appropriation provides contractual services for the repair, rehabilitation and modification of existing facilities; the construction of new facilities; the acquisition of related facility equipment; the design of facilities projects; and advance planning related to future facilities needs.

The funds requested for 1985 provide for: the continuation of prior year's endeavors in meeting the facilities requirements for the Space Shuttle; Space Shuttle Payload support operations; modification of aeronautical research and development facilities; repair, rehabilitation, and modification of other facilities to maintain, upgrade and improve the usefulness of the NASA physical plant; minor construction of new facilities; and facility planning and design activities.

The projects and amounts in the budget estimate reflect Space Shuttle and Space Shuttle Payload requirements that are time sensitive to meet specific milestones. Other program requirements for 1985 include the repairs to test stand 500 at Marshall Space Flight Center; construction of a numerical aerodynamic simulation facility at the Ames Research Center; modifications to the 8-foot high temperature tunnel at Langley Research Center; construction of an addition to the network control center at Goddard Space Flight Center, construction of an earth and space science laboratory at the Jet Propulsion Laboratory; and construction of a 34-meter antenna, and modifications of a 64-meter antenna, DSS-63, in Spain,

The FY 1985 program continues to meet the objectives of preserving and enhancing the capabilities and usefulness of existing facilities and ensuring safe economical and efficient use of the NASA physical plant. This request continues the necessary rehabilitation and modification program begun in prior years and continues a repair program. The purpose of the repair program is to restore facilities to a condition substantially equivalent to their originally designed capability. The minor construction program continues to provide a means to accomplish smaller facility projects which accommodate changes in technical and institutional requirements.

Funds requested for facility planning and design cover advance planning and design requirements for potential future projects, master planning, facilities studies, engineering reports and studies and the preparation of facility project design drawings and bid specifications.

The request for FY 1985 is \$160,000,000, an increase of \$4,500,000 above the appropriation for FY 1984. Outlays are estimated to be \$163,000,000 in FY 1985, an increase of \$24,500,000 from the estimate for FY 1984.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PROPOSED APPROPRIATION LANGUAGE

CONSTRUCTION OF FACILITIES

For construction, repair, rehabilitation and modification of facilities, minor construction of new facilities and additions to existing facilities, and for facility planning and design not otherwise provided, for the National Aeronautics and Space Administration, and for the acquisition or condemnation of real property, as authorized by law, ~~[\$135,500,000]~~ **\$160,000,000**, to remain available until September 30, ~~[1986]~~ **1987: Provided**, That, notwithstanding the limitation on the availability of funds appropriated under this heading by this appropriation Act, when any activity has been initiated by the incurrence of obligations therefor, the amount available for such activity shall remain available until expended, except that this provision shall not apply to the amounts appropriated pursuant to the authorization for repair, rehabilitation and codification of facilities, minor construction of new facilities and additions to existing facilities, and facility planning and *. **Provided further**, That no amount appropriated pursuant to this or any other Act may be used for the lease or construction of a new contractor-funded facility for exclusive use in support of a contract or contracts with the National Aeronautics and Space Administration under which the Administration would be required to substantially amortize through payment or reimbursement such contractor investment, unless an appropriation Act specifies the lease or contract pursuant to which such facilities are to be constructed or leased or such facility is otherwise identified in such Act: **Provided further**, That the Administrator may authorize such facility lease or construction, with the approval of the Committees on Appropriations if he determines that deferral of such action until the enactment of the next appropriation Act would be inconsistent with the interest of the Nation in aeronautical and space activities. [For an additional amount for "Construction of facilities", \$20,000,000, to remain available until September 30, 1986, for partial funding of the construction of facilities at the John F. Kennedy Space Center for the Solid Rocket Booster assembly and refurbishment contractor and for warehousing to be used by the Shuttle processing contractor: **Provided**, That with the funds appropriated under the "Space flight, control and data communications" account in the 1985 Housing and Urban Development-Independent Agencies Appropriation Act (Public Law 98-45), NASA may enter into a contract with Morton Thiokol, Inc., to amortize the Thiokol Casting Pit Covers over a twelve-year period for a total cost of not to exceed \$23,000,000 under the authority granted under Public Law 98-45.] (42 U.S.C. 2451 et seq.; Department of Housing and Urban Development-Independent Agencies Appropriation Act, 1984; Supplemental Appropriation Act, 1984.)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
Program and Financing (in thousands of dollars)

Identification code 80-0107-0-1-999	Budget plan (amounts for construction of facilities actions programed)			Obligations		
	1983 actual	1984 est.	1985 est.	1983 actual	1984 est.-	1985 est.
Program by activities:						
Direct program:						
1. Space transportation systems	25,245	61,300	31,200	38,145	59,000	37,800
2. Scientific investigations in space	1,740	12,000	6,700	565	11,400	7,800
4. Space research and technology	---	---	1,600	---	---	1,200
5. Aeronautical research and technology	20,115	24,000	30,000	30,648	46,300	37,600
7. Supporting activity.	54,240	58,200	90,500	55,869	68,700	86,400
Total direct program	101,340	155,500	160,000	125,227	185,400	170,800
Reimbursable program	10,000	12,500	10,000	6,372	12,701	10,707
10.00 Total obligations.	111,340	168,000	170,000	131,599	198,101	181,507

Identification code 80-0107-0-1-999		Budget plan (amounts for construction of facilities actions programed)			Obligations		
		1983 actual	1984 est.	1985 est.	1983 actual	1984 est.	1985 est.
Financing:							
11.00	Offsetting collections from Federal funds.	---	---	---	-8,792	-12,500	-10,000
	Unobligated balance available, start of year: For completion of prior year budget plans :						
21.40	Appropriation	---	---	---	-120,084	-111,166	-84,716
21.98	Fund Balance.....	---	---	---	-3,123	-5,544	-5,343
22.40	Unobligated balance transferred from other accounts.. ..	---	---	---	-15,000	-3,450	---
	Unobligated balance available, end of year: For completion of prior year budget plans :						
24.40	Appropriation.	---	---	---	111,166	84,716	73,916
24.98	Fund Balance	---	---	---	5,544	5,343	4,636
25.00	Unobligated balance lapsing	37,599	---	---	37,629	---	---
39.00	Budget authority	138,939	155,500	160,000	138,939	155,500	160,000
Budget authority:							
40.00	Appropriation.... ..	97,500	155,500	160,000	97,500	155,500	160,000
42.00	Transferred from other accounts.....	3,840	---	---	3,840	---	---
43.00	Appropriation (adjusted)	101,340	155,500	150,000	101,340	155,500	160,000
50.00	Reappropriated.	37,599	---	---	37,599	---	---
Relation of obligations to outlays:							
71.00	Obligations incurred,				122,807	185,601	171,507
72.40	Obligated balance, start of year.....				92,492	107,131	154,232
74.40	Obligated balance ■ end of year.. ..				-107,131	-154,232	-162,739
77.00	Adjustments in expired				-29	---	---
90.00	Outlays.... ..				108,139	138,500	163,000

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1985 ESTIMATES

SUMMARY OF THE BUDGET PLAN BY LOCATION

<u>Location</u>	<u>FY 1983</u>	<u>FY 1984</u> (In Dollars)	<u>FY 1985</u>
George C. Marshall Space Flight Center	---	---	1,600,000
Space Shuttle Facilities.....	28,695,000	61,300,000	31,200,000
Space Shuttle Payload Facilities.....	1,740,000	12,000,000	6,700,000
Goddard Space Flight Center..	2,580,000	---	2,200,000
Wallops Flight Facility	2,150,000	---	---
Jet Propulsion Laboratory.....	---	4,300,000	12,200,000
Ames Research Center.....	---	3,900,000	16,500,000
Hugh L. Dryden Flight Research Facility	3,500,000	800,000	---
Langley Research Center.....	16,200,000	9,500,000	13,800,000
Lewis Research Center.....	3,915,000	10,600,000	---
Various Locations.....	---	1,700,000	13,800,000
Repair.....	14,000,000	17,500,000	20,000,000
Rehabilitation and Modification.....	19,000,000	21,500,000	25,000,000
Minor Construction.....	3,750,000	3,800,000	5,000,000
Facility Planning and Design..	8,000,000	8,600,000	12,000,000
 Total Plan.....	 <u>103,530,000</u>	 <u>155,500,000</u>	 <u>160,000,000</u>

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SUMMARY OF BUDGET PLAN BY COGNIZANT OFFICE

	<u>FY 1983</u>	<u>FY 1984</u> (In Dollars)	<u>FY 1985</u>
Office of Space Flight	30,435,000	73,300,000	37,400,000
Office of Space Science and Applications	4,730,000	1,600,000	12,200,000
Office of Aeronautics and Space Technology..	23,615,000	24,000,000	32,400,000
Office of Space Tracking and Data Systems	---	5,200,000	16,000,000
Office of Management.	<u>44,750,000</u>	<u>51,400,000</u>	<u>62,000,000</u>
 Total Plan.....,.....	 <u>103,530,000</u>	 <u>155,500,000</u>	 <u>160,000,000</u>

SUMMARY OF BUDGET PLAN BY SUBFUNCTION

<u>Code</u> <u>No.</u>				
253	Space Flight..	28,695,000	61,300,000	31,200,000
254	Space Science, Applications, and Technology	1,740,000	12,000,000	8,300,000
255	Support Space Activities.....	52,980,000	58,200,000	90,200,000
(250)	Subtotal, General Science, Space and			
	Technology..	83,415,000	131,500,000	129,700,000
402	Air Transportation	<u>20,115,000</u>	<u>24,000,000</u>	<u>30,300,000</u>
	 Total.....	 <u>103,530,000</u>	 <u>155,500,000</u>	 <u>160,000,000</u>

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1985 ESTIMATES

SUMMARY OF THE BUDGET PLAN BY LOCATION

Cognizant Office	Budget Activity	Subfunction Code	Location and Project	FY 1983	FY 1984	FY 1985	Page No.
				(Thousands of Dollars)			
SF	4	254	<u>GEORGE C. MARSHALL SPACE FLIGHT CENTER</u>	---	---	1,600	
			Repairs to Test Stand 500.....	---	---	1,600	CF 1-1
			<u>SPACE SHUTTLE FACILITIES AT VARIOUS LOCATIONS AS FOLLOWS:</u>	28,695	61,300	31,200	
SF	1	253	Modification of Site Electrical Substation (JSC).....	---	---	3,200	CF 2-1
SF	1	253	Modifications for Single Engine Testing (NSTL).....	---	---	3,000	CF 2-8
SF	1	253	Construction of Launch Complex 39 Logistics Facility (KSC).....	---	10,000	10,000	CF 2-14
SF	1	253	Construction of Solid Rocket Booster Assembly and Refurbishment Facility (KSC).....	---	10,000	15,000	CF 2-22
SF	1	253	Modifications for Additional Chillers for Mission Control Center (JSC)	---	2,300	---	
SF	1	253	Modifications to Mobile Launch Platform #3 (KSC).....	---	27,300	---	
SF	1	253	Modification of Manufacturing and Final Assembly Facilities for External Tanks (MAF)	17,845	11,700	---	
SF	1	253	Construction of Solid Rocket Booster Assembly and Refurbishment Facility, Site Preparation (KSC).....	3,450	---	---	
SF	1	253	Construction of Solid Rocket Booster Surface Preparation Facility (KSC).....	2,060	---	---	
SF	1	253	Installation of Support Facilities Air Force Plant #42, Palmdale, CA (KSC)	1,240	---	---	
SF	1	253	Minor Shuttle-Unique Projects, Various Locations.. ..	1,860	---	---	
SF	1	253	Modifications to Solid Rocket Booster Refurbishment and Subassembly Facilities (KSC).....	1,700	---	---	
SF	1	253	Thrust Vector Control Deservicing and Disassembly Facility (KSC).....	540	---	---	

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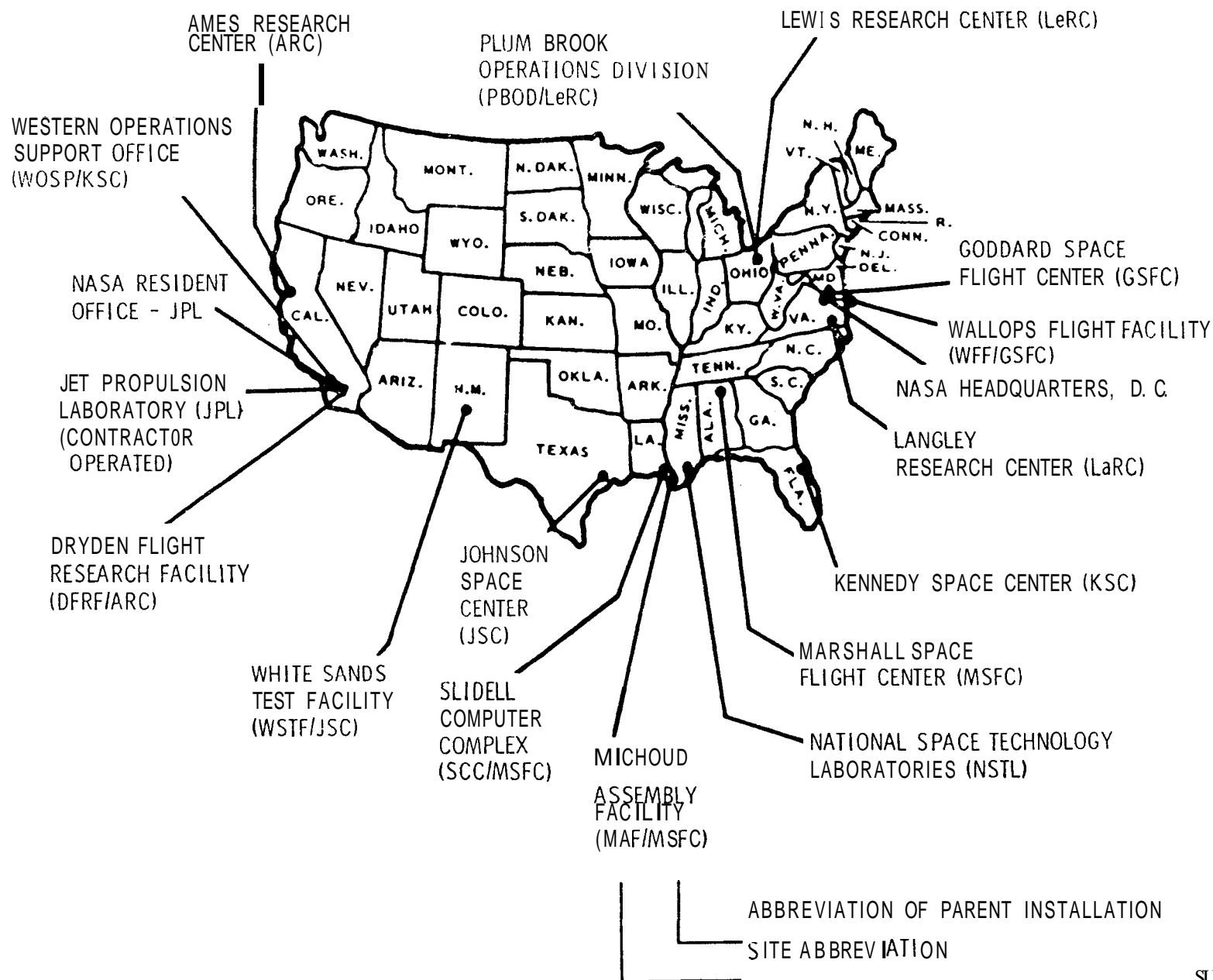
<u>Cognizant Office</u>	<u>Budget Activity</u>	<u>Subfunction Code</u>	<u>Location and Project</u>	<u>FY 1983</u> (Thousands of Dollars)	<u>FY 1984</u>	<u>FY 1985</u>	<u>Page No.</u>
			<u>SPACE SHUTTLE PAYLOAD FACILITIES AT VARIOUS LOCATIONS,</u>				
			<u>AS FOLLOWS:</u>	<u>1,740</u>	<u>12,000</u>	<u>6,700</u>	
SF	2	254	Construction of Additions to Cargo Hazardous Servicing Facility (KSC)	---	---	4,600	CF 3-1
AST	2	254	Construction of Biomedical Research Facility (ARC).....	---	---	2,100	CF 3-10
SF	2	254	Construction of Cargo Hazardous Servicing Facility (KSC)	---	9,000	---	
SF	2	254	Modifications to Spacecraft Assembly and Encapsulation Facility (SAEF-2) for Cargo Processing (KSC)	---	3,000	---	
SF	2	254	Rehabilitation and Modification for Payload Ground Support Operations (KSC)	1,740	---	---	
			<u>GODDARD SPACE FLIGHT CENTER</u>	<u>2,580</u>	<u>---</u>	<u>2,200</u>	
ST&DS	7	255	Construction of Addition to the Network Control Center..	---	---	2,200	CF 4-1
SSA	7	255	Rehabilitation and Modification of Utility Systems..	2,580	---	---	
			<u>WALLOPS FLIGHT FACILITY</u>	<u>2,150</u>	<u>---</u>	<u>---</u>	
SSA	7	255	Rehabilitation of Airfield	2,150	---	---	
			<u>JET PROPULSION LABORATORY</u>	<u>---</u>	<u>4,300</u>	<u>12,200</u>	
SSA	7	255	Construction of Earth and Space Science Laboratory	---	---	12,200	CF 5-1
ST&DS	7	255	Construction of Frequency Standards Laboratory...	---	2,700	---	
SSA	7	255	Modifications to Space Flight Operations Facility..	---	1,600	---	
			<u>AMES RESEARCH CENTER</u>	<u>---</u>	<u>3,900</u>	<u>16,500</u>	
AST	5	402	Construction of Numerical Aerodynamic Simulation Facility	---	---	16,500	CF 6-1
AST	5	402	Construction of Fluid Mechanics Laboratory..	---	3,900	---	
			<u>HUGH L. DRYDEN FLIGHT RESEARCH FACILITY</u>	<u>3,500</u>	<u>800</u>	<u>---</u>	
ST&DS	7	255	Construction of Aeronautical Tracking Facility.	---	800	---	
AST	7	255	Construction of Data Analysis Facility...	3,500	---	---	

SUM a

Cognizant Office	Budget Activity	Subfunction Code	Location and Project	FY 1983 (Thousands of Dollars)	FY 1984	FY 1985	Page No.
			<u>LANGLEY RESEARCH CENTER</u>	<u>16,200</u>	<u>9,500</u>	<u>13,800</u>	
AST	5	402	Modifications to 8-Foot High Temperature Tunnel.. .. .	---	---	13,800	CF 7-1
AST	5	402	Modifications and Addition for Composite Materials Laboratory (1293A)	---	5,100	---	
AST	5	402	Modifications to 30- by 60-Foot Wind Tunnel (643)	---	4,400	---	
AST	5	402	Modifications to the 4- by 7-Meter Low Speed Tunnel	7,200	---	---	
AST	5	402	Modifications to Upgrade the Transonic Dynamics Tunnel...	9,000	---	---	
			<u>LEWIS RESEARCH CENTER</u>	<u>3,915</u>	<u>10,600</u>	<u>---</u>	
AST	5	402	Modifications for Small Engine Component Testing Facility	---	7,000	---	
AST	5	402	Modifications to Icing Research Tunnel (11)	---	3,600	---	
AST	5	402	Modification of Rocket Engine Test Facility for Altitude Testing	995	---	---	
AST	5	402	Modification to 450 PSI Air System in Engine Research Building.	2,920	---	---	
			<u>VARIOUS LOCATIONS</u>	<u>---</u>	<u>1,700</u>	<u>13,800</u>	
ST&DS	7	255	Construction of 34-Meter Antenna, Madrid, Spain (JPL)	---	---	6,000	CF 8-1
ST&DS	7	255	Modifications of 64-Meter Antenna, DSS-63, Madrid, Spain (E)	---	---	7,800	CF 8-8
ST&DS	7	255	Relocation of 26-Meter SIDN Antenna ■ Spain (JPL)	---	1,700	---	
MGMT	7	255	<u>Repair of Facilities at Various Locations, Not in Excess of \$750,000 Per Project</u>	<u>14,000</u>	<u>17,500</u>	<u>20,000</u>	CF 9-1
MGMT	7	255	<u>Rehabilitation and Modification of Facilities at Various Locations. Not in Excess of \$750,000 Per Project</u>	<u>19,000</u>	<u>21,500</u>	<u>25,000</u>	CF 10-1

Organizational Unit	Budget Activity	Subfunction Code	Location and Project	FY 1983	FY 1984	FY 1985	Page No.
				(Thousands of Dollars)			
MGMT	7	255	Minor Construction of New Facilities and Additions to Existing Facilities at Various Locations, Not in Excess of \$500,000 Per Project	3,750	3,800	5,000	CF 11-1
MGMT	7	255	Facility Planning and Design.	8,000	8,600	12,000	CF 12-1
TOTAL				<u>103,530</u>	<u>155,500</u>	<u>160,000</u>	

LOCATION OF MAJOR AND COMPONENT INSTALLATIONS



RECORDED VALUE OF CAPITAL TYPE PROPERTY
IN-HOUSE AND CONTRACTOR-HELD
AS OF SEPTEMBER 30, 1983
(DOLLARS IN THOUSANDS)

Reporting Installation	Real Property					Equipment	Fixed Assets In Progress	Grand Total
	Land	Buildings	Other Structures and Facilities	Leasehold Improvements	Total			
Ames Research Center	\$ 2,929	\$ 237,965	\$ 22,750	\$ -0-	\$ 263,644	\$ 348,604	\$ 184,611	\$ 796,859
ARC Moffett Field CA.	2,928	220,930	11,652	-0-	235,510	240,081	178,536	654,527
Dryden Flight Facility								
Edwards, CA.	-0-	16,344	10,752	-0-	27,096	81,717	5,675	114,488
Various Locations (a)	1	691	346	-0-	1,038	26,806	-0-	27,844
Goddard Space Flight Center	2,860	149,811	119,615	-0-	272,286	583,843	24,942	881,071
GSFC - Greenbelt, MD.	1,362	102,604	19,220	-0-	123,186	214,497	19,628	357,311
Tracking Stations Network	28	15,164	40,348	-0-	55,540	218,373	2,902	276,815
WFF - Wallops Island, VA.	1,470	31,998	60,009	-0-	93,477	59,571	2,412	155,460
Various Locations (a)	-0-	45	38	-0-	83	31,402	-0-	91,485
Jet Propulsion Laboratory	1,188	102,760	74,835	1,826	180,609	269,267	36,066	485,942
JPL - Pasadena, CA.	1,188	87,926	11,580	1,679	102,373	194,564	36,066	333,003
Deep Space Network	-0-	14,834	63,255	147	78,236	74,703	-0-	152,939
Johnson Space Center	10,571	210,687	67,977		289,235	649,879	42,687	981,801
JSC - Houston, TX	7,002	173,794	41,031	-0-	221,827	386,261	38,249	646,337
White Sands Test Facility								
Las Cruces, NM.	-0-	9,518	21,389	-0-	30,907	19,002	-0-	49,909
Various Locations (a)	3,569	27,375	5,557	-0-	36,501	244,616	4,438	285,555
Kennedy Space Center	71,345	407,436	426,382	-0-	905,163	1,576,544	81,369	2,563,076
KSC - Cape Canaveral, FL.	71,345	405,436	426,382	-0-	505,163	1,538,586	81,369	2,525,118
Western Test Range, Longac CA.	-0-	-0-	-0-	-0-	-0-	3,998	-0-	3,998
Various Locations (a)	-0-	-0-	-0-	-0-	-0-	33,960	-0-	33,960
Langley Research Center	162	142,321	305,051	-0-	447,534	217,076	43,879	708,491
LARC - Hampton, VA.	162	142,321	305,000	-0-	447,483	197,361	43,879	688,723
Various Locations (a)	-0-	-0-	51	-0-	51	19,717	-0-	13,768
Lewis Research Center	3,651	227,958	80,742	136	312,487	171,350	21,574	505,411
LERC - Cleveland, OH	316	151,521	61,278	136	213,251	128,399	21,574	363,224
Plumbrook - Sandusky, OH.	3,335	76,437	15,464	-0-	99,236	6,357	-0-	105,593
Various Locations (a)	-0-	-0-	-0-	-0-	-0-	36,594	-0-	36,594
Marshall Space Flight Center	7,164	241,842	141,076	-0-	390,082	416,751	837	807,670
MSFC Huntsville, AL.	-0-	126,729	65,647	-0-	192,376	245,144	837	438,357
Michoud Assembly Facility, LA.	7,095	105,201	62,263	-0-	174,559	36,731	-0-	211,290
Slidell Computer Complex, A	69	5,063	2,482	-0-	7,614	5,683	-0-	13,297
Various Locations (a)	-0-	4,849	10,684	-0-	15,533	129,193	-0-	144,726
National Space Tech. Lab.	18,061	70,909	193,269	-0-	262,239	30,306	-0-	312,545
NSSTL - NSSTL Sta, MS.	18,061	70,909	193,269	-0-	282,239	30,245	-0-	312,484
Various Locations (a)	-0-	-0-	-0-	-0-	-0-	61	-0-	61
NASA Headquarters	-0-	-0-	-0-	-0-	-0-	27,749	-0-	27,749
NASA HQs., Wash. DC	-0-	-0-	-0-	-0-	-0-	10,702	-0-	10,702
Various Locations (a)	-0-	-0-	-0-	-0-	-0-	17,047	-0-	17,047
TOTAL	\$ 117,931	\$ 1,791,689	\$ 1,431,697	\$ 1,962	\$3,343,279	\$4,291,371 (b)	\$435,965	\$8,070,615

(a) Includes property in possession of contractor at various locations.

(b) Includes Special Test Equipment \$326,114

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

SUMMARY

MARSHALL SPACE FLIGHT CENTER

<u>Office of Space Flight/Office of Aeronautics and Space Technology:</u>	<u>Amount</u>	<u>Page No.</u>
Repairs to Test Stand 500.....	<u>1,600,000</u>	CF 1-1

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1985 ESTIMATES
REPAIRS TO TEST STAND 500
LOCATION PLAN

CF 1-1

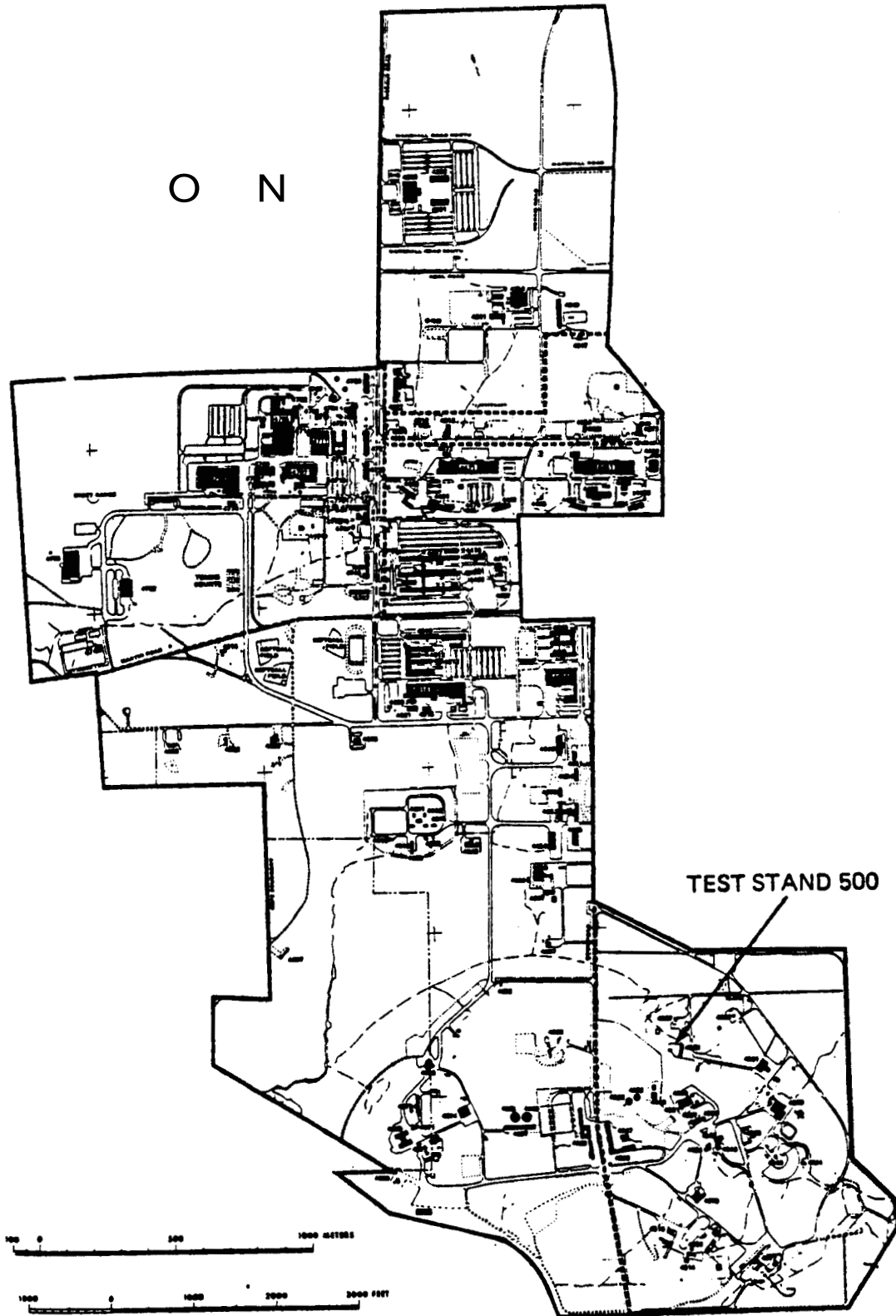


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE	Repairs to Test Stand 500
INSTALLATION.	George C. Marshall Space Flight Center
FY 1985 CoF ESTIMATE: \$1,600,000	

LOCATION OF PROJECT: Marshall Space Flight Center, Madison County, Alabama

COGNIZANT HEADQUARTERS OFFICE. Office of Space Flight/Office of Aeronautics and Space Technology

FY 1984 AND PRIOR YEARS FUNDING- The following prior years funding is related to this project-

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF funding	154,000	---	154,000
Capitalized investment.....	<u>N/A</u>	<u>2,618,500</u>	<u>2,618,500</u>
Total	<u>154,000</u>	<u>2,618,500</u>	<u>2,772,500</u>

SUMMARY PURPOSE AND SCOPE:

This project restores Test Stand 500 to its original test capability to support technology development in LO₂ and LH₂ engine propulsion. Test Stand 500 was extensively damaged by a hydrogen explosion in late 1980, precluding all hydrogen testing and reducing test rates below subsequent program requirements. Tests and engine operating experience indicate that additional technology development is now required to improve engine performance and reliability, and extend the hours of engine operation.

PROJECT JUSTIFICATION:

Test Stand 500, used primarily for testing of Space Shuttle Main Engine (SSME) size turbomachinery bearings, plays a vital role in Marshall Space Flight Center's propulsion technology development program. Current and future programs planned for this facility include SSME enhancement, turbo pump ball bearing research, SSME flow meter development, resolution of flight problems, and Orbital Transfer Vehicle breadboard testing. The test stand, in its current configuration, without a hydrogen testing capability cannot effectively support current and future engine improvement programs. The hydrogen explosion in 1980 severely damaged the structural members of the test stand and its associated electrical and instrumentation control systems, and high pressure gas lines. The explosion also destroyed a preparation building and technical support building. Temporary measures were taken to provide instrumentation and control for oxygen bearing testing, however, this limited test capability is inadequate to support current and future programs.

Future exploration of space depends heavily upon continued development of propulsion technology. Essential to this development is the capability for conducting tests at appropriate conditions of temperature, flow rates and pressure to permit evaluation of design options and to determine performance over extended periods. The repair of Test Stand 500 will provide these required capabilities.

IMPACT OF DELAY:

NASA will not be able to adequately support the propulsion technology development test program schedule without the testing capability of Test Stand 500 being fully restored. This in turn will seriously impact the investigation of advanced engine bearing concepts and the capability for anomaly resolutions.

PROJECT DESCRIPTION:

This project includes all necessary repairs to rebuild Test Stand 500 (Building 4522). The work involves repair of test stand structural members, stairs, and elevator; replacing electrical and instrumentation control systems and high pressure gas lines; and rebuilding the preparation and technical support buildings. The Preparation Support Building, a 28-foot by 48-foot structure, will be a masonry (concrete block) construction with electrical and high/low pressure air system provided. The heating, ventilating, and air-conditioning (HVAC) system will be designed to maintain a positive pressure to prevent the entry of hazardous gases.

The Terminal Support Building will be a two-story structure, approximately 27 feet by 33 feet, with 16-inch steel reinforced concrete walls. Electrical and high/low pressure air and positive pressure HVAC systems will be provided. Electrical control and instrumentation cabling from the test positions will converge in this building and then feed underground to the respective control and instrumentation centers.

PROJECT COST ESTIMATE:

	Unit of Measure	Quantity	Unit cost	cost
<u>Land Acquisition</u>	—	—	—	—
<u>Construction</u>	—	—	—	<u>1,600,000</u>
Repair test stand structural, instrumentation, controls, and gas lines.....	LS	—	—	1,155,000
Preparation support building.. ..	LS	—	—	135,000
Terminal support building	LS	—	—	310,000
<u>Equipment</u>	—	—	—	—
<u>Fallout Shelter</u> (not feasible).....	—	—	—	—
Total.....				<u>1,600,000</u>

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan

Figure 2 - Sketch of Test Stand 500

OTHER EQUIPMENT SUMMARY :

No other equipment is required to complete this project.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

MARSHALL SPACE FLIGHT CENTER
FISCAL YEAR 1985 ESTIMATES
REPAIRS TO TEST STAND 500

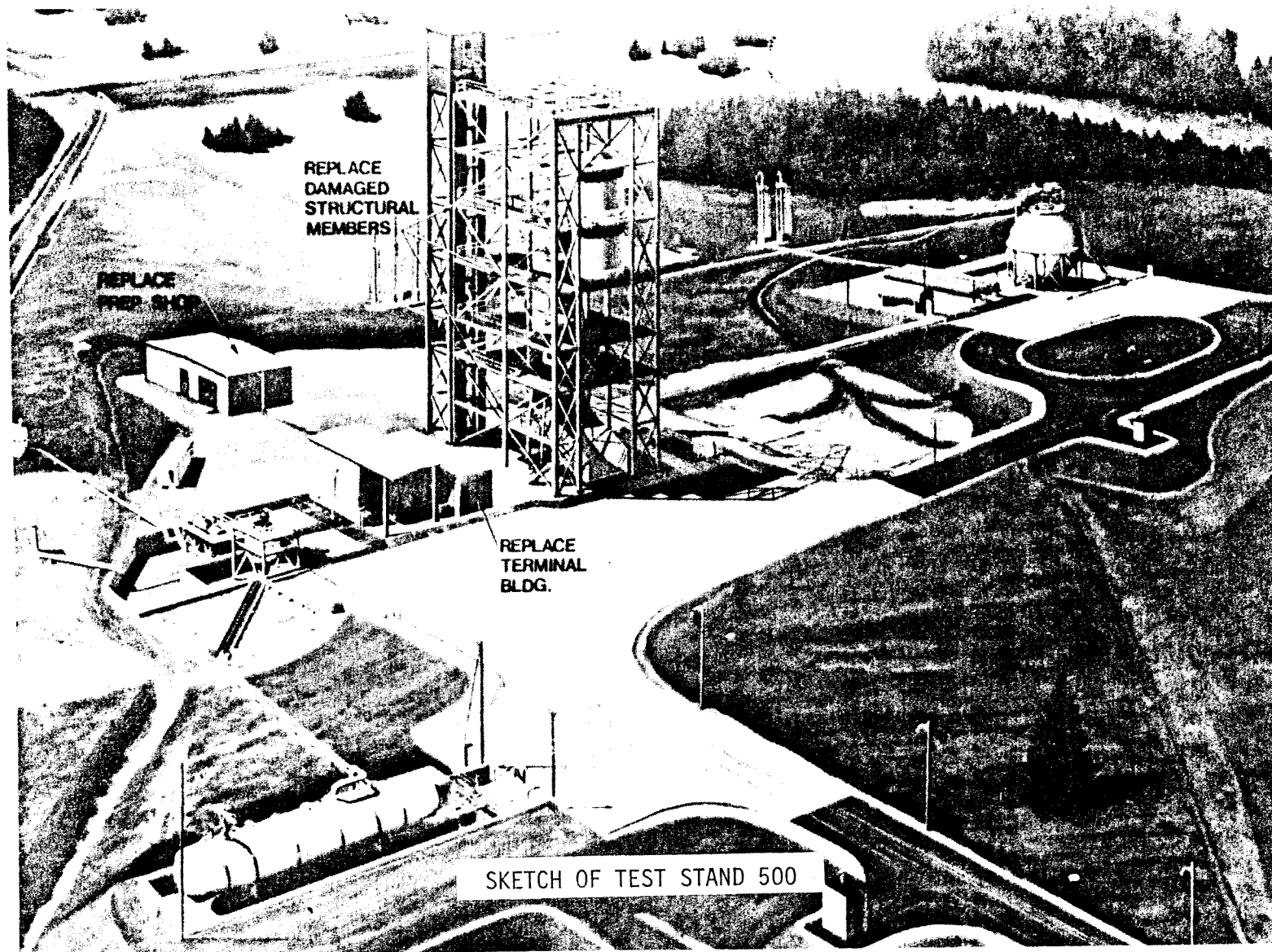


FIGURE 2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

SUMMARY

SPACE SHUTTLE FACILITIES

<u>Office of Space Flight:</u>	<u>Amount</u>	<u>Page No</u>
Modification of Site Electrical Substation , Johnson Space Ctr.	3,200,000	CF 2-1
Modification for Single Engine Testing , National Space Technology Laboratories.. ..	3,000,000	CF 2-8
Construction of Launch Complex 39 Logistics Facility, Kennedy Space Ctr.	10,000,000	CF 2-14
Construction of Solid Rocket Booster Assembly and Refurbishment Facility, Kennedy Space Center.. ..	<u>15,000,000</u>	CF 2-22
Total.....	<u><u>31,200,000</u></u>	

**LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
MODIFICATION OF SITE ELECTRICAL SUBSTATION**

LOCATION PLAN

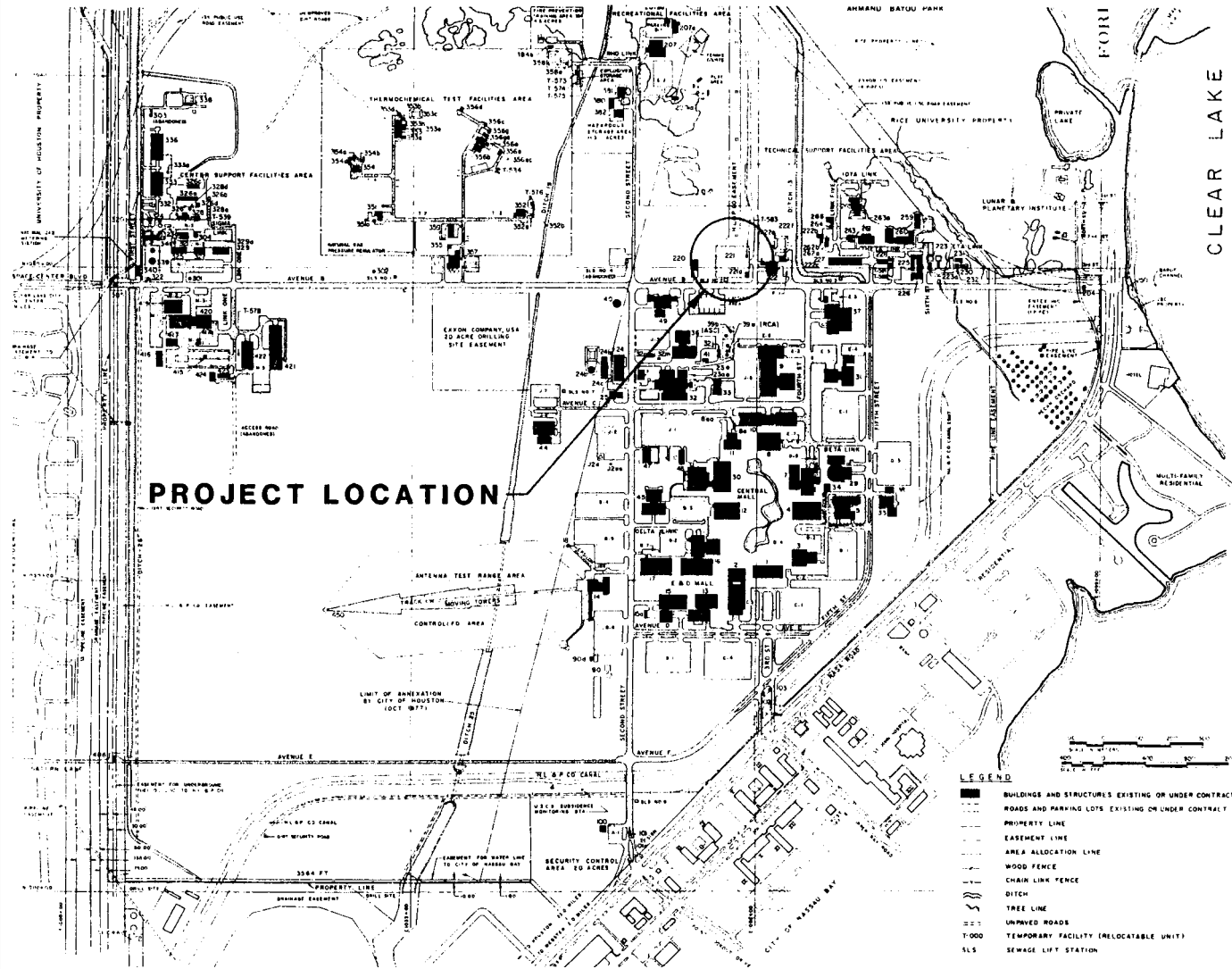


FIGURE 1

CONSTRUCTION OF FACILITIES
FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE: Modification of Site Electrical Substation

INSTALLATION: Lyndon B. Johnson Space Center

FY 1985 CoF ESTIMATE: \$3,200,000

LOCATION OF PROJECT: Houston, Harris County, Texas

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF funding... ..	221,000	---	221,000
Capitalized investment.....	<u>N/A</u>	<u>1,289,000</u>	<u>1,289,000</u>
Total.....	<u>221,000</u>	<u>1,289,000</u>	<u>1,510,000</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the adequate physical separation of the dual 12.47 kV distribution system switchgear, power cables, duct banks, and manholes within the Johnson Space Center (JSC) site substation. This separation is required to eliminate a potential single point failure of the center electrical power system and assure a more reliable electric power service for equipment testing, astronaut training, flight simulations and maintenance of high flight rate support. This project will also replace obsolete fixed-tap transformers with automatic load tap changer transformers to regulate the increasingly frequent out-of-tolerance 12 kV bus voltage.

PROJECT JUSTIFICATION:

The JSC site electrical substation, Building 221, is the single source of primary electrical power for the Center. Powered by two 138 kV Houston Light and Power Company aerial transmission lines, voltage is decreased to 12.47 kV and distributed to center buildings via switchgear and dual feeder busses through underground ducts and utility tunnels. Although the present electrical system is operationally flexible and nominally redundant, the close proximity of some of the system components threatens the continuity of electrical service under severe electrical faults and/or fire conditions.

Presently, breakers, protective relays, and controls for the Bus 1 and Bus 2 distribution systems are located in the same enclosure. The aisle between the two systems is approximately 6 feet wide. When work or repairs are being performed on one system, the backup system is in jeopardy because of the close proximity and the sensitivity of the controls and protective equipment. The highly sensitive relays can trip due to vibrations or impacts. In the existing system, the feeder cables from the Bus 1 and Bus 2 systems are fed through a common duct bank and through a common manhole before they are distributed to the various site buildings via the utility tunnel system. A short circuit condition in either the duct bank or the common manhole could start a fire which would cause damage to cables of both Bus 1 and Bus 2 distribution systems. On October 10, 1981, a fire in one system caused a total center outage. Because of the present and projected increase in flight rate activity, it is vital that the two systems be physically separated to provide a reliable redundant electrical power system.

In addition to providing the required reliability, this project will also correct a serious voltage regulation deficiency. The large voltage variations now experienced at JSC on a near daily basis of plus or minus 9 percent, has seriously affected computers, motors, fluorescent lighting fixtures and other electrical equipment, causing frequent and unscheduled downtimes and impacting many of the programs at JSC. Houston Lighting and Power maintains voltages only within limits to satisfy a broad range of customers. For precise and reliable operation of computers and test equipment, JSC requires a voltage regulation within plus or minus 3 percent. This project will correct this deficiency by replacing two obsolete fixed-tap transformers with new transformers that have automatic load-tap changers.

IMPACT OF DELAY:

The delay of corrective measures provided by this project will prolong the exposure of the JSC electrical power system to a single point failure which could severely disrupt crew training and mission flight support activities and leave the electric power distribution system with unregulated, out-of-tolerance voltage, with the attendant adverse affect on computers, instrumentation, and other electrical equipment.

PROJECT DESCRIPTION:

The project will include the purchase and installation of nine 12.47 kV circuit breakers, protective relays, approximately 3,000 feet of power cable duct banks, 13,500 feet of three-phase 15 kV power cable, overhead bus work and associated equipment. This equipment will be located approximately 50 feet west of the existing **Bus 1** location and will replace the present **Bus 1** equipment. In addition, the two fixed-tap main site transformers will be replaced with two 25 MVA transformers with automatic load-tap changers, control wiring and foundations.

PROJECT COST ESTIMATE:

This cost estimate is based on a completed preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>	---	---	---	<u>3,200,000</u>
12 Duct bank enclosure.....	LF	3,000	235.00	705,000
400 MCM, 15 kV cable.....	LF	13,500	40.74	550,000
15 kV power circuit breakers and bus	EA	9	63,778.00	574,000
Relays, capacitors, and modification to grounding systems and controls.....	LS	---	---	200,000
25 MVA transformers with automatic load-tap changers..	EA	2	450,000	900,000
New concrete pad with piers and beams	LS	---	---	35,000
New manholes and modifications to existing manholes..	EA	3	14,000.00	42,000
Splices and termination work around existing utilities and tunnels.....	LS	---	---	66,000
Overhead feeder bus system and lighting protection..	LS	---	---	128,000
<u>Equipment</u>	---	---	---	---
<u>Fallout Shelter</u> (not feasible).....	---	---	---	---
Total.....				<u>3,200,000</u>

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan

OTHER EQUIPMENT SUMMARY:

No other equipment is required to complete this project.

FUTURE C&F ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future C&F funding is required to complete this project.

LYNDON B. JOHNSON SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
MODIFICATION OF SITE ELECTRICAL SUBSTATION

SITE PLAN

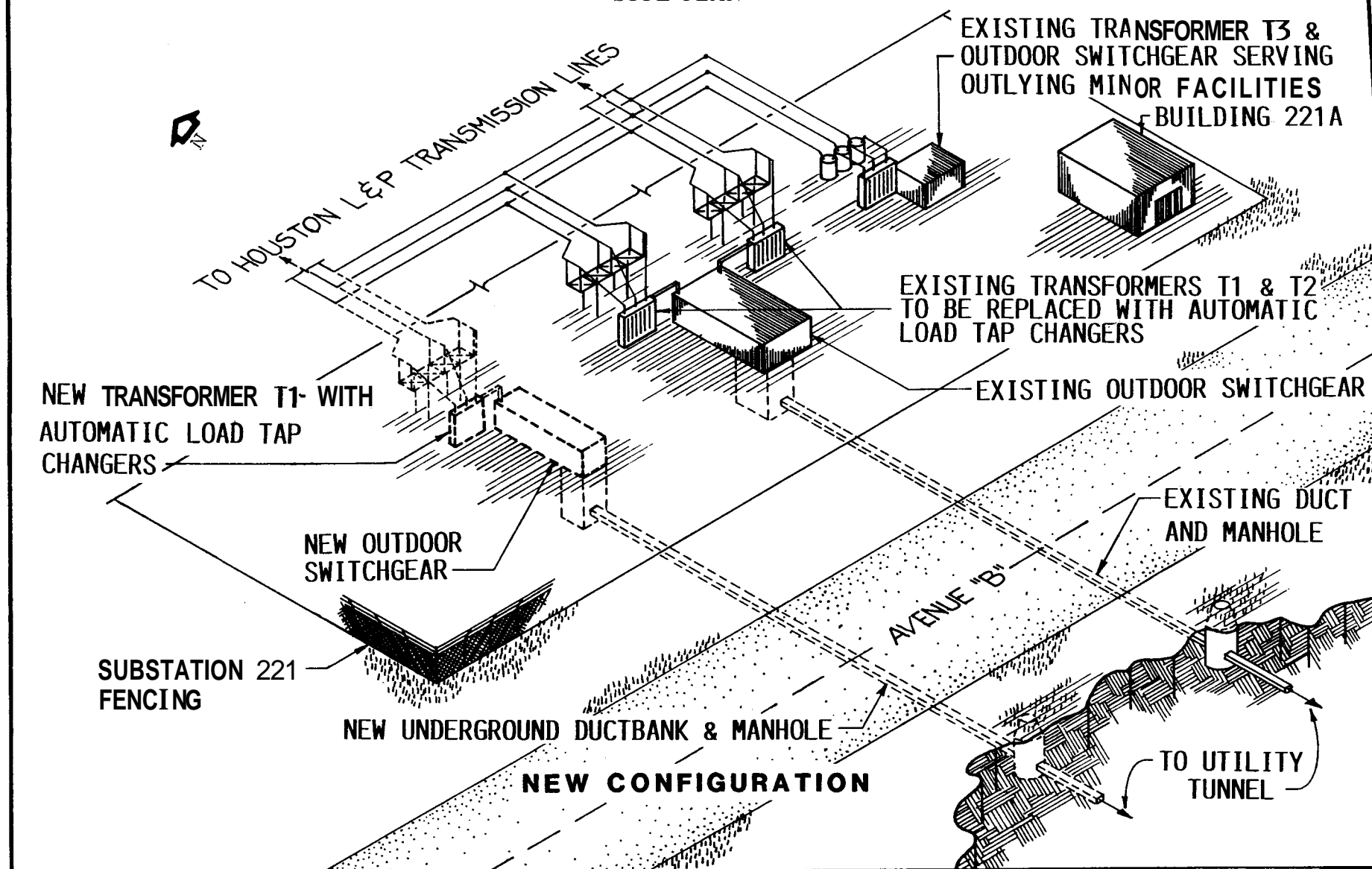


FIGURE 2

NATIONAL SPACE TECHNOLOGY LABORATORIES
FISCAL YEAR 1985 ESTIMATES
MODIFICATIONS FOR SINGLE ENGINE TESTING

LOCATION PLAN

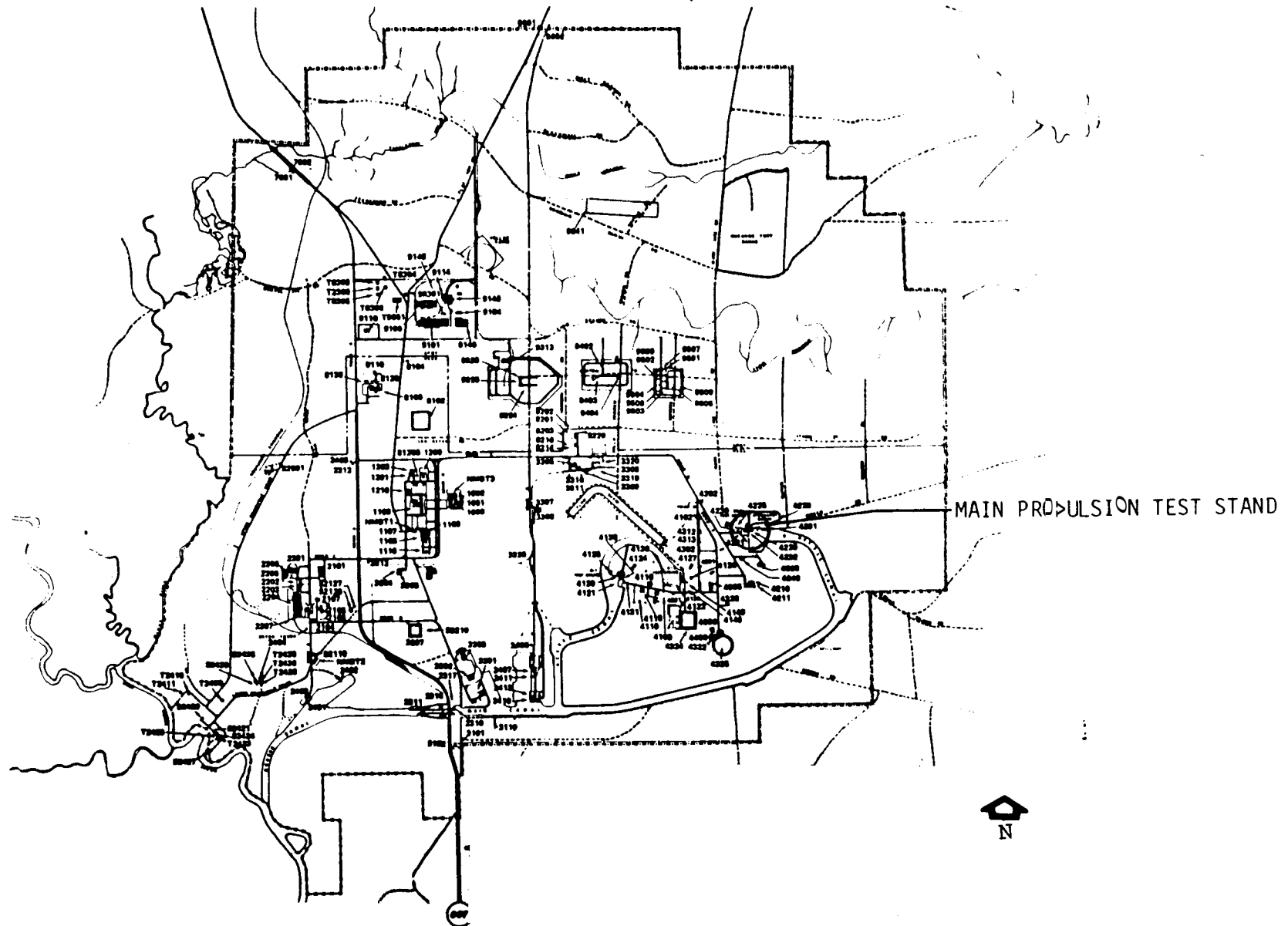


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	<u>Modifications for Single Engine Testing</u>
INSTALLATION:	<u>National Space Technology Laboratories</u>
FY 1985 CoF ESTIMATE: <u>\$3,000,000</u>	

LOCATION OF PROJECT: National Space Technology Laboratories, Hancock County, Mississippi

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF funding.	252,000	---	252,000
Capitalized investment.....	<u>N/A</u>	<u>30,840,700</u>	<u>30,840,700</u>
Total.....	<u>252,000</u>	<u>30,540,700</u>	<u>31,092,700</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for modifications to the Main Propulsion Test (MPT) Stand at the National Space Technology Laboratories (NSTL) to provide capability for single Space Shuttle Main Engine (SSME) testing. The testing is necessary for engine improvements leading to life extension of key engine components at greater reliability. The current capability to conduct three-engine cluster firings in the modified test stand will also be retained.

PROJECT JUSTIFICATION:

The Space Shuttle is the Nation's primary space transportation system for at least the next two decades. A major NASA objective is for this system to reach its full potential and lowest cost of operation in providing routine access to space. A key aspect of this objective is to improve the performance of the SSME at full power and to extend the life of the engine. Upgraded versions of the SSME will require sea level testing to validate improvements in a full engine system configuration. The test program will focus on advancing the engine technology by testing the fully integrated system comprised of turbo-machinery, bearings, turbine blades, etc. This project will provide a capability to test a full integrated engine system. The initial function of this test position will be for "green run" of SSME engine turbopumps.

At present, two engine test stands are in operation at the NSIL to meet the SSME test requirements for engine certification at high thrust levels, acceptance of engines and spares, life extension and confidence testing for 55 missions, and testing after major overhauls. The two NSTL stands (A-1 and A-2) will be fully utilized throughout the 1980's in order to accomplish SSME test requirements. To support the heavy work load of "green running" turbo-machinery, engine improvements and life-cycle testing a third test position will be required in 1986. This project provides the necessary modifications of the B-2 position of the MPT Stand for Single Engine Testing to meet these test requirements.

IMPACT OF DELAY:

Delay of this project will prevent timely development of performance data vital to improvement of performance and life extension of the SSME, and will adversely impact currently scheduled activities on the existing SSME test positions.

PROJECT DESCRIPTION:

The project modifications include: removal of the Shuttle external tank and installation of existing liquid oxygen/liquid hydrogen run tanks; modification of the stand structure to support the installation of the run tanks and servicing of the engine; modification of the propellant fill and drain lines; rerouting existing high-pressure gas lines to accommodate the new configuration; and minor instrumentation changes. A new single engine mount will also be provided.

The propellant feed lines will be modified for interconnection to the liquid hydrogen and liquid oxygen barges, docked nearby, which provide propellant replenishing capability. The facility modifications will be engineered to facilitate removal of the run tanks for return to the external tank MPTA configuration to support three-engine cluster firing.

PROJECT COST ESTIMATE:

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>	---	---	---	<u>3,000,000</u>
Remove and reconnect stand structures and orbiter simulator; remove external tank; install run tanks..	---	---	---	465,000
Modify stand structures.....	---	---	---	662,000
Modify run and fill lines	---	---	---	981,000
Instrumentation changes.....	---	---	---	119,000
Single engine mount.....	---	---	---	773,000
<u>Equipment</u>	---	---	---	---
<u>Fallout Shelter</u> (not feasible).....	---	---	---	---
Total.....				<u><u>3,000,000</u></u>

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Main Propulsion Test Stand

OTHER EQUIPMENT SUMMARY :

Relocation and certification of existing NASA owned LOX and LH₂ run tanks.

FUTURE CoF FUNDING REQUIRED TO COMPLETE PROJECTS:

Additional CoF funding may be required in a subsequent budget if it is determined that altitude simulation capability is necessary for future test programs.

NATIONAL SPACE TECHNOLOGY LABORATORIES
FISCAL YEAR 1985 ESTIMATES
MODIFICATIONS FOR SINGLE ENGINE TESTING

MAIN PROPULSION TEST STAND

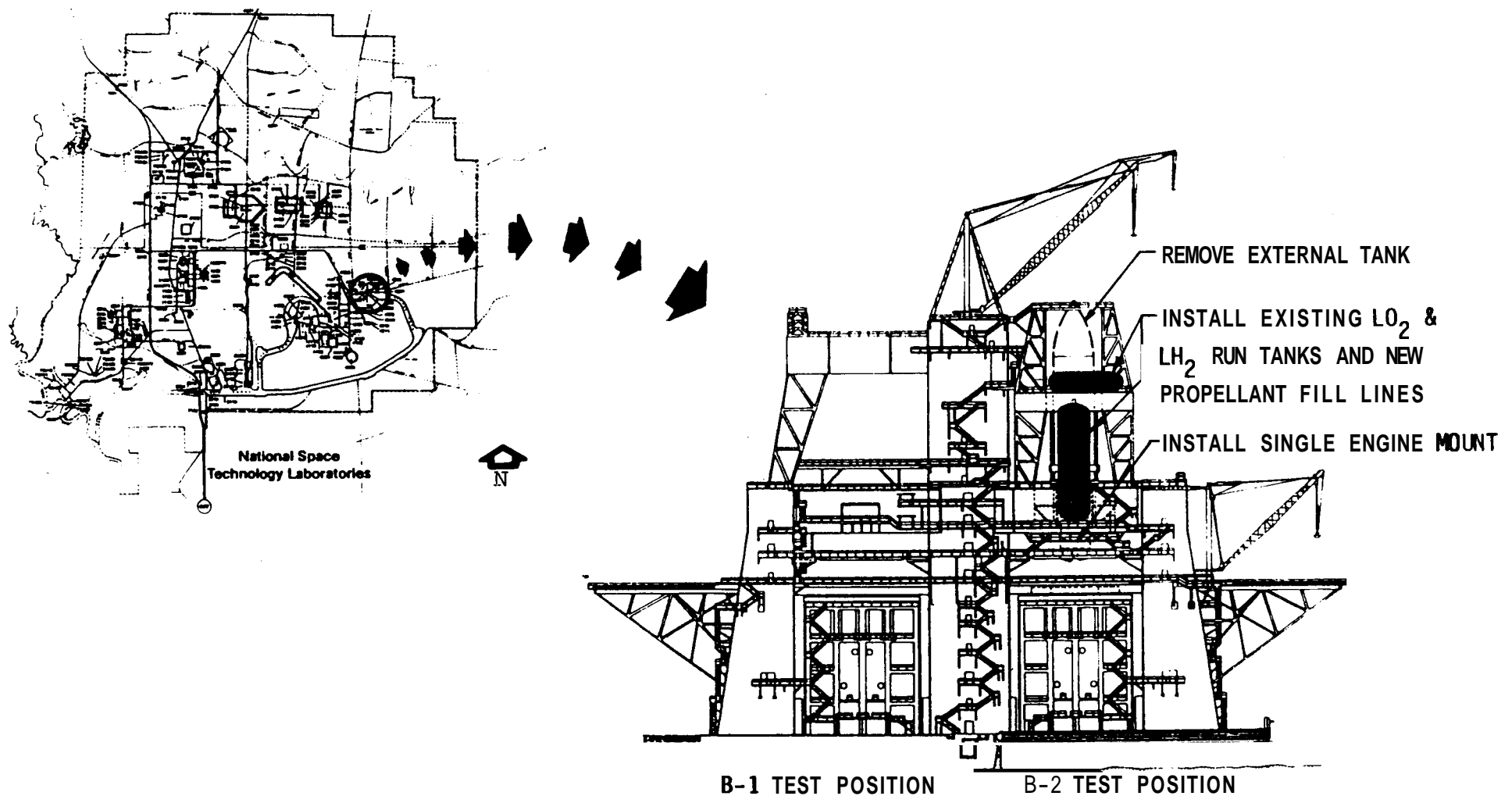
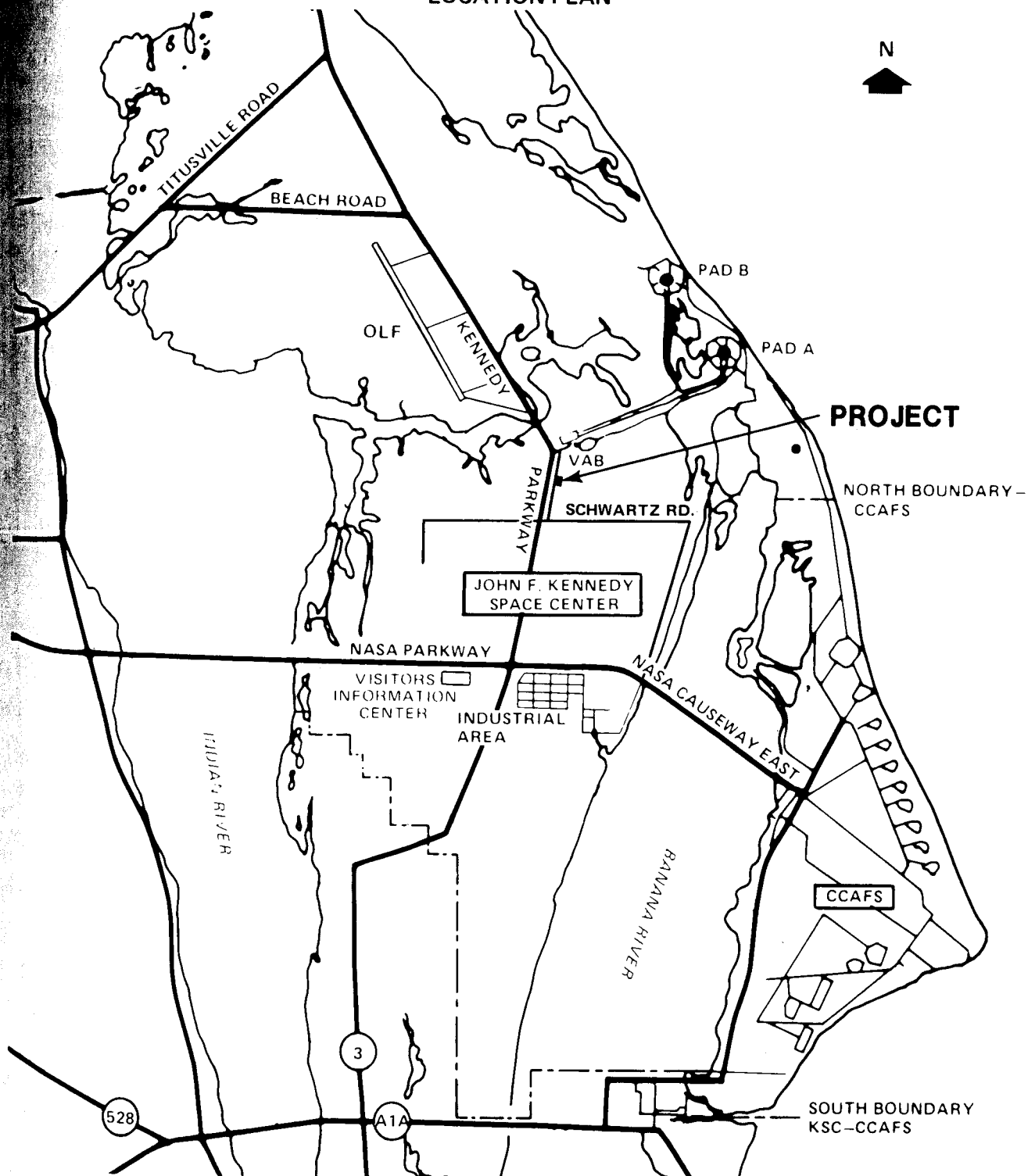


FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF LAUNCH COMPLEX 39 LOGISTICS FACILITY

LOCATION PLAN



CF 2-14

FIGURE 1

SPACE SHUTTLE
PAYLOAD
FACILITIES

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	<u>Construction of Launch Complex 39 Logistics Facility</u>		
INSTALLATION:	<u>John F. Kennedy Space Center</u>		
		FY 1985 CoF ESTIMATE:	<u>\$10,000,000</u>

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF funding.... ..	*	10,000,000	10,000,000
Capitalized investment.....	<u>N/A</u>	<u>---</u>	<u>---</u>
Total.....	<u>---</u>	<u>10,000,000</u>	<u>10,000,000</u>

*It is planned to execute this facility project through a design/construct contract. The cost of design is provided for in the FY 1984 increment of construction funds.

SUMMARY PURPOSE AND SCOPE:

This project continues work partially funded in FY 1984 for construction of a logistics facility in the Kennedy Space Center (KSC) Launch Complex 39 (LC-39) area. It will provide critically needed storage space to support Space Shuttle processing, checkout and launch operations. This increment of funding will complete

CF 2-15

an approximately 265,000-square foot logistics , a petroleum oil and (POL) storage area, and associated loading docks, truck ramps, parking, access roads, and railroad spur.

PROJECT JUSTIFICATION:

The increasing orbiter fleet and flight rate have added to the complexity of the logistics and warehousing functions at KSC. Furthermore, experience gained during the first three years of Space Transportation System (STS) operations has highlighted the need for dedicated storage space for the Ground Support Equipment (GSE) spares, flight spares, and other parts and materials required for the processing, launch and support operations. Detailed studies coupled with this experience show that a serious shortage of 265,000 square feet of warehouse space will exist by 1985.

Currently, items are being stored in KSC institutional logistics facilities and other scattered facilities. The present storage facilities are inefficient and geographically poorly situated. A more efficient overall logistics configuration is needed for the operations of the Shuttle Processing Contractor (SPC). This facility is urgently required for the SPC to efficiently support increasing flight rates and to adequately protect the government's investment in Shuttle parts and support equipment.

Providing this dedicated storage will also free institutional storage facilities that are now being used for STS logistics. This will return urgently needed space to the Base Operating Contractor (BOC).

The SPC contract for processing launch and landings at KSC was recently awarded to the Lockheed Space Operations Corporation. The proposal included a Lockheed option to provide a logistics facility through corporate investment. At the request of Congress, this option was not exercised and, instead, the first increment of construction funding for the logistics facility (\$10 million) has been provided in a FY 1984 supplemental appropriation. This FY 1985 budget request is needed to provide the balance of funding to complete construction.

IMPACT OF DELAY:

Delaying this funding will prevent NASA from completing in a timely manner, the logistics facility construction begun with FY 1984 resources. This will detrimentally impact KSC's capability to process and launch at planned and projected STS flight rates.

PROJECT DESCRIPTION:

This budget request is for the second increment of funding for construction of an approximately 265,000-square foot logistics facility south of the Vehicle Assembly Building (VAB). The facility will be designed to provide 200,000 square feet of storage including shelf storage, pallet and rack storage, automated storage, conditioned storage and secure storage; 25,000 square feet for receiving and shipping; and 40,000 square feet of support areas.

The project also includes a POL storage/holding area, loading docks and truck ramps, parking for vehicles, necessary road intersection modifications, and a rail spur extending from the existing rail line, west of Contractor Road.

CF 2-17

PROJECT COST ESTIMATE:

The total cost for the Launch Complex 39 Logistics Facility is estimated at \$20 million, including preparation of final design. This project represents the second phase of construction funding to complete the facility.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>	---	---	---	<u>10,000,000</u>
Launch complex 39 logistics facility (phase II).....	LS	---	---	10,000,000
<u>Equipment</u>	---	---	---	---
<u>Fallout Shelter</u> (not feasible).....	---	---	---	---
Total.....				<u>10,000,000</u>

LIST OF RELATED GRAPHICS:

- Figure 1 - Location Plan
- Figure 2 - Project Site
- Figure 3 - Site Layout
- Figure 4 - Floor Plan

OTHER EQUIPMENT SUMMARY:

Additional equipment and furnishings will be required when this facility is activated. A portion of the facility will be equipped with an automated logistics handling system. Additionally, equipment such as bins, shelving, and other storage means will be provided for other portions of the facility. These noncollateral equipment items will cost approximately \$6,000,000 and will be funded from R&D and R&PM resources.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
OF LAUNCH COMPLEX 39 LOGISTICS FACILITY

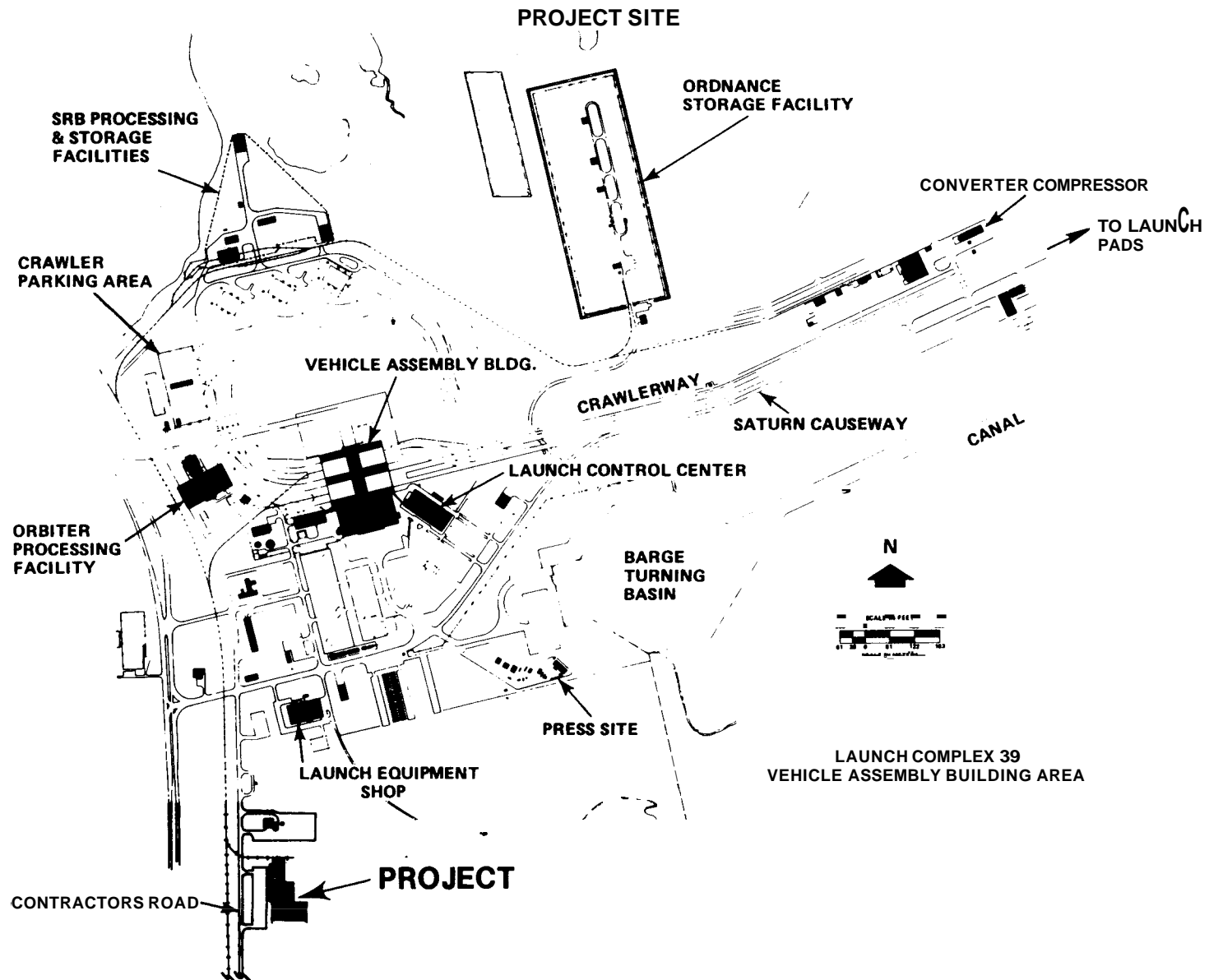


FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1987 ESTIMATES
ION OF CH COMPLEX 39 LOGISTICS FACILITY

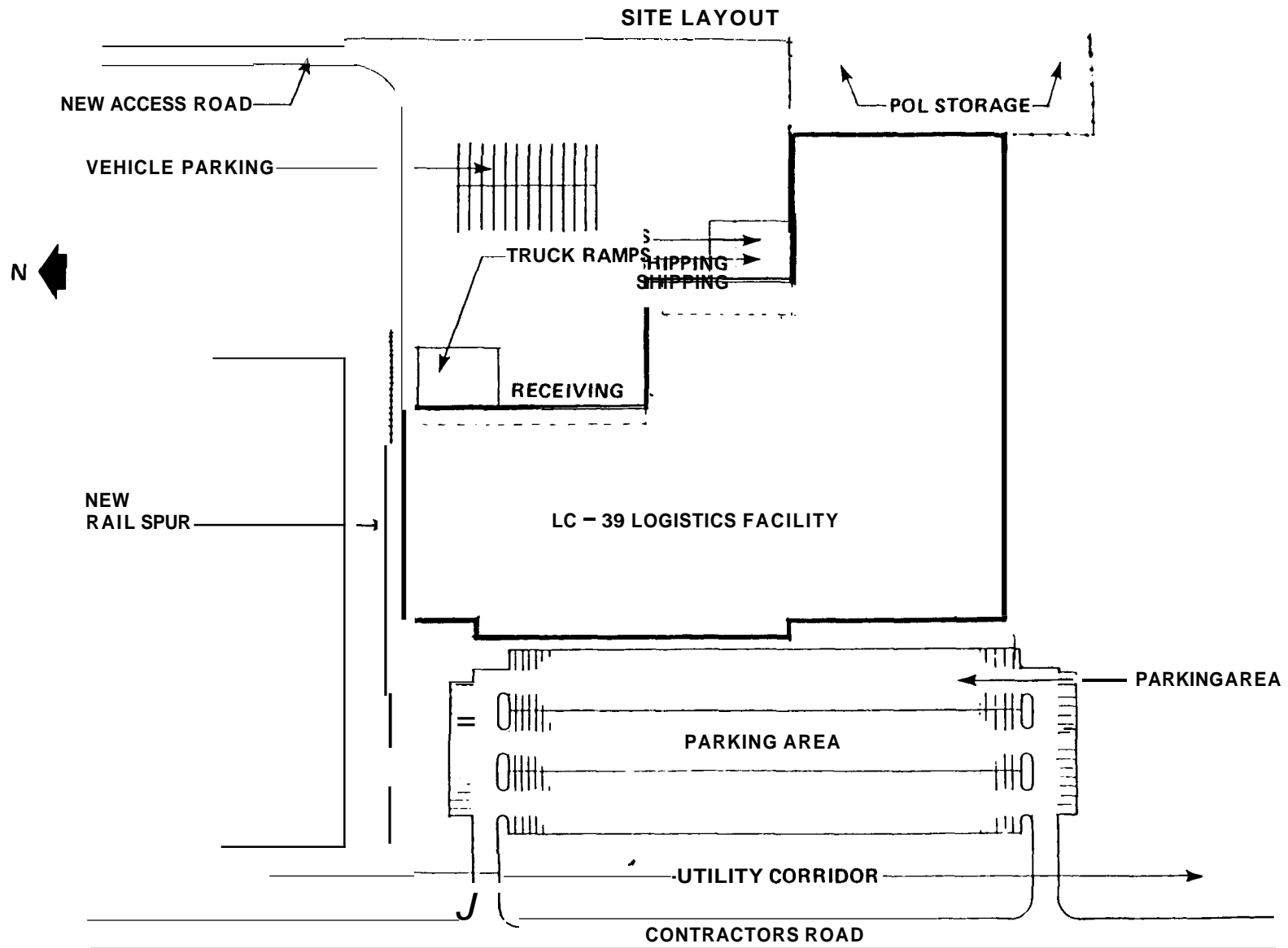


FIGURE 3

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
OF LAUNCH COMPLEX 39 LOGISTICS FACILITY

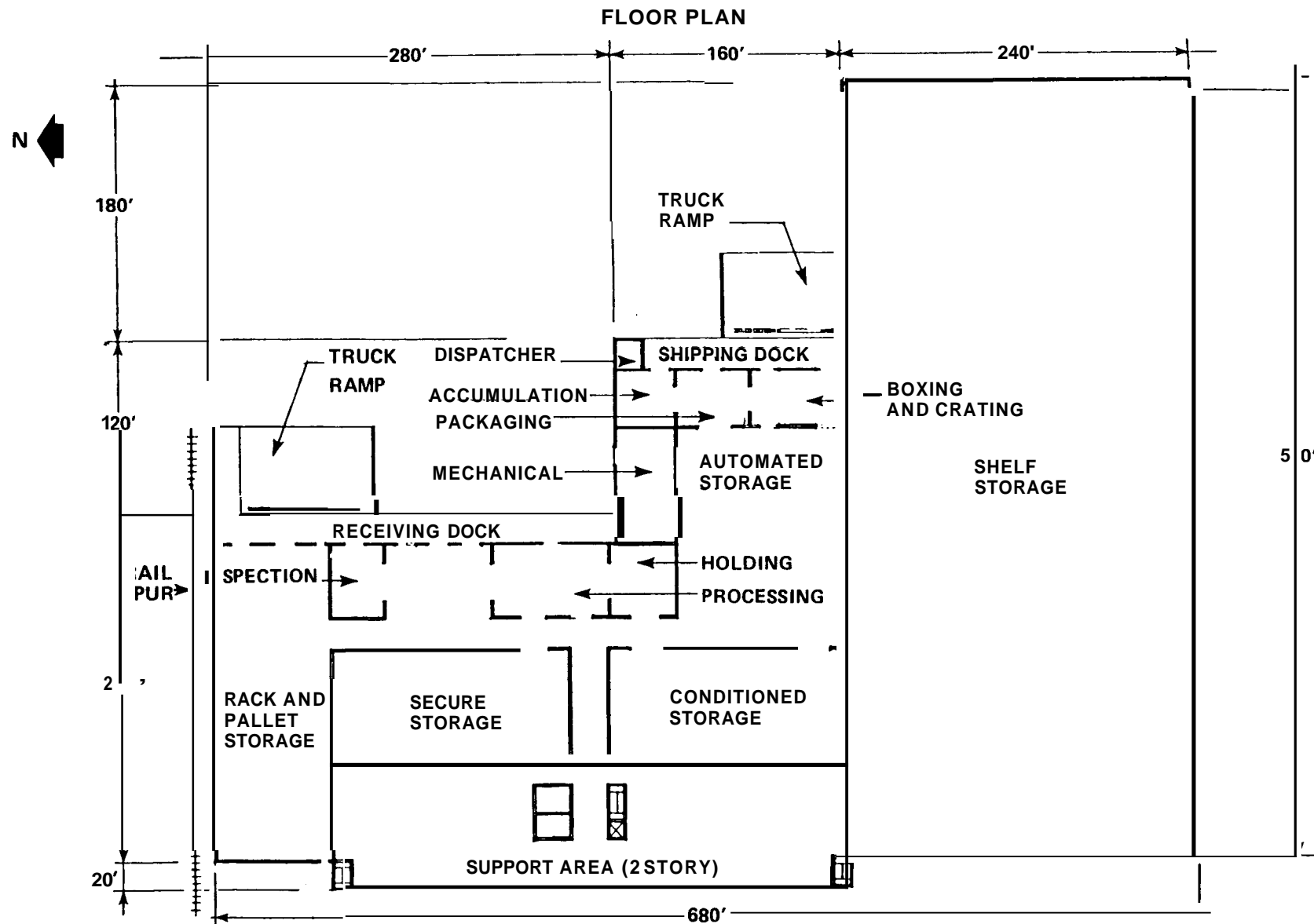


FIGURE 4

CF 2-21

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF SOLID ROCKET BOOSTER
ASSEMBLY AND REFURBISHMENT FACILITY

CF 2-22

LOCATION PLAN

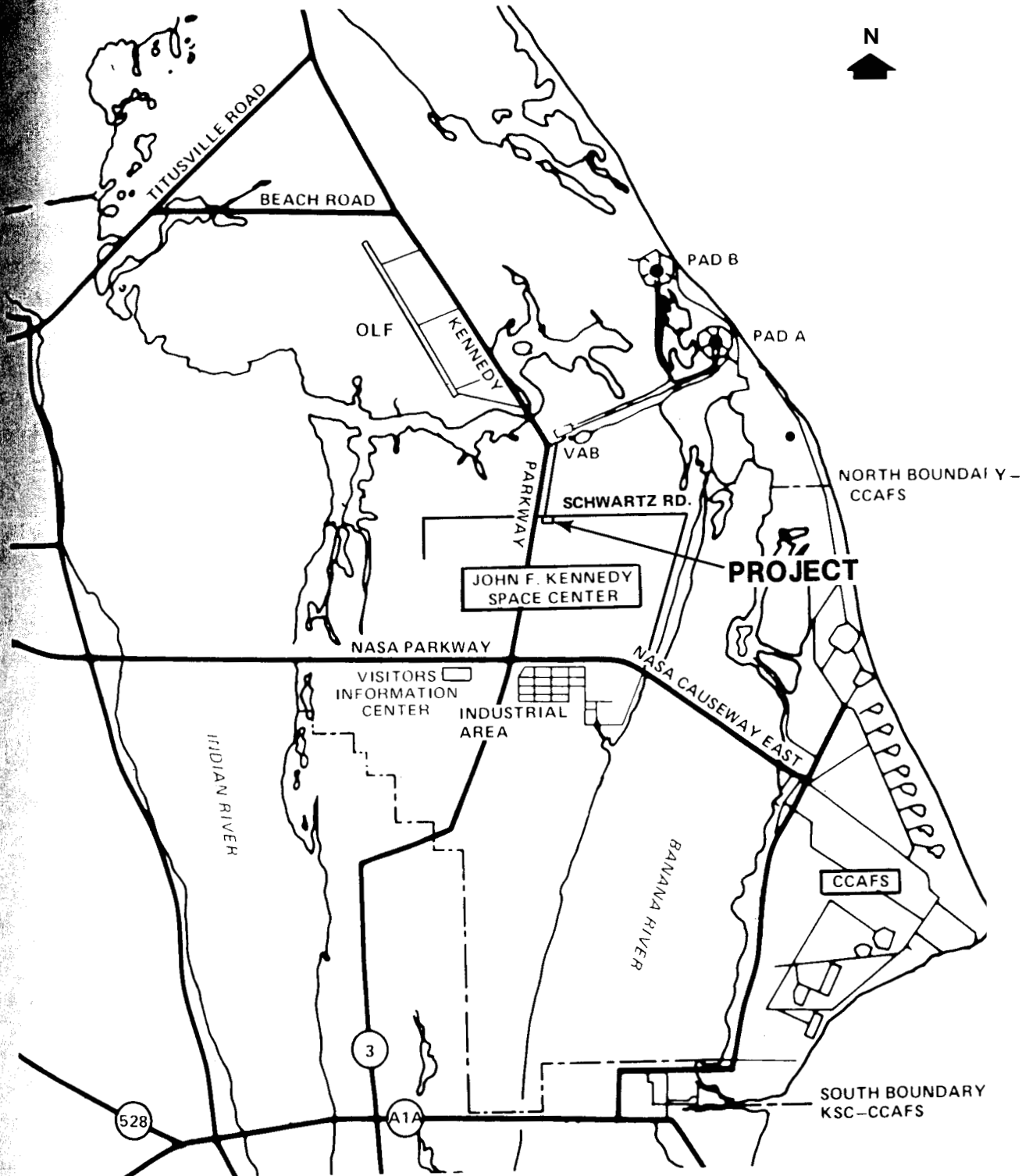


FIGURE 1

SPACE SHUTTLE
PAYLOAD
FACILITIES

GODDARD SPACE

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	<u>Construction of Solid Rocket Booster Assembly and Refurbishment Facility</u>		
INSTALLATION:	<u>John F. Kennedy Space Center</u>		
	FY 1985 CoF ESTIMATE:	<u>\$15,000,000</u>	

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific' CoF funding.....	---	13,450,000	13,450,000
Capitalized investment.	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Total	<u>---</u>	<u>13,450,000</u>	<u>13,450,000</u>

Design of the Solid Rocket Booster (SRB) Assembly and Refurbishment Facility will be provided by the selected SRB Assembly and Refurbishment Contractor.

SUMMARY PURPOSE AND SCOPE:

This project continues work funded in prior years for the construction of an SRB Assembly and Refurbishment Facility at Kennedy Space Center. It will provide a consolidated facility which is specifically designed for production flow layout and configuration for efficient processing of the Solid Rocket Booster propulsion system components that are required to support the Space Transportation System (STS) mission model.

CF 2-23

PROJECT JUSTIFICATION

The Solid Rocket Booster (SRB) is one of two primary propulsion systems for the Space Shuttle. After the Shuttle launch is completed, the SRBs are recovered at sea and returned to Hangar AF at KSC where the expended SRB is cleaned, deserviced, and disassembled. The Solid Rocket Motor (SRM) segment casings are returned to the manufacturer for processing and reuse. All other components (aft skirt assemblies, Thrust Vector Control (TVC) System, forward skirt assemblies, frustrums, and nose cones) are refurbished at KSC. The TVC System is deserviced/disassembled at Hangar AF and then moved to Hangar N where it is repaired, reassembled, and prepared for installation in the aft skirt assembly for hot fire testing. After initial cleaning of the aft skirt and other major components at Hangar AF, they are grit-blasted and repainted in the SRB Surface Preparation Facility (Bastic Paint) before being moved to the reassembly points currently in Hangar N and the Vertical Assembly Building (VAB) low bay.

As a result of detailed studies by NASA, industry teams, and industrial consultants, the existing VAB low bay SRB processing facilities were found to be inefficient, costly to operate, and unable to satisfy flight rate schedules beyond approximately 16 per year. This new facility will provide a consolidated and specifically designed production flow layout to promote efficiency in flight hardware processing and meet the planned flight rates. Only the Hangar AF Complex which includes the SRB disassembly facilities, the TVC deservicing/disassembly, and Bostic Paint facility will be retained.

The first phase of funding for this proposed facility was provided for by Congress in an FY 1984 Supplemental Appropriation. This FY 1985 budget request will provide the second increment of funding which is needed to complete the facility.

IMPACT OF DELAY :

Construction of the SRB Assembly and Refurbishment Facility was started with prior year resources to provide the capability to deliver the first flight articles scheduled for STS-39. The mission model requires STS-39 SRB's to be the first flight articles from the new facility. Such a schedule is essential to meeting currently planned flight rates. To assure that this facility is available in sufficient time to be checked out, activated, and started up to support the higher flight rates, this project must be completed with FY 1985 CoF resources.

PROJECT DESCRIPTION:

The SRB Assembly and Refurbishment Facility will be designed by the selected SRB processing contractor. The facility will include manufacturing and administrative areas; paint, oil and lubricants (POL) storage for volatile and flammable liquids; and a hazardous waste building for temporary staging of hazardous waste prior

to removal from the site. The manufacturing building will provide work areas, spray cells, and cure cells for required special coatings. A clean environment will be provided for forward and aft assemblies and subassemblies. Ordnance shop facilities, supply storage, and other process facilities will also be provided. The project also includes the provision of a safe area for conducting TVC hot firings.

CF 2-25

PROJECT COST ESTIMATE:

The total cost for the SRB Assembly and Refurbishment Facility is estimated at \$25 million exclusive of site preparation (\$3.45 million). Site preparation and the first increment (\$10 million) of the SRB Assembly and Refurbishment Facility were provided with prior year resources. This project represents the second increment of construction required to complete the facility.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit Cost</u>	<u>Cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>	---	---	---	<u>15,000,000</u>
SRB assembly and refurbishment facility (phase (II))....	LS	---	---	15,000,000
<u>Equipment</u>	---	---	---	---
<u>Fallout Shelter</u> (not feasible).....	---	---	---	---
Total.....				<u><u>15,000,000</u></u>

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Project Site

OTHER EQUIPMENT SUMMARY:

Special tooling and equipment will be needed for initial operations. Much of this equipment exists and will be furnished by the government. It is also anticipated that certain contractor-owned tooling and equipment will be used. Any additional tooling and equipment that may be required will be funded from R&D sources.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

CoF resources may be required in the future to provide for additional processing facilities to support increased launch rates.

CF 2-26

**JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF SOLID ROCKET BOOSTER
ASSEMBLY AND REFURBISHMENT FACILITY**

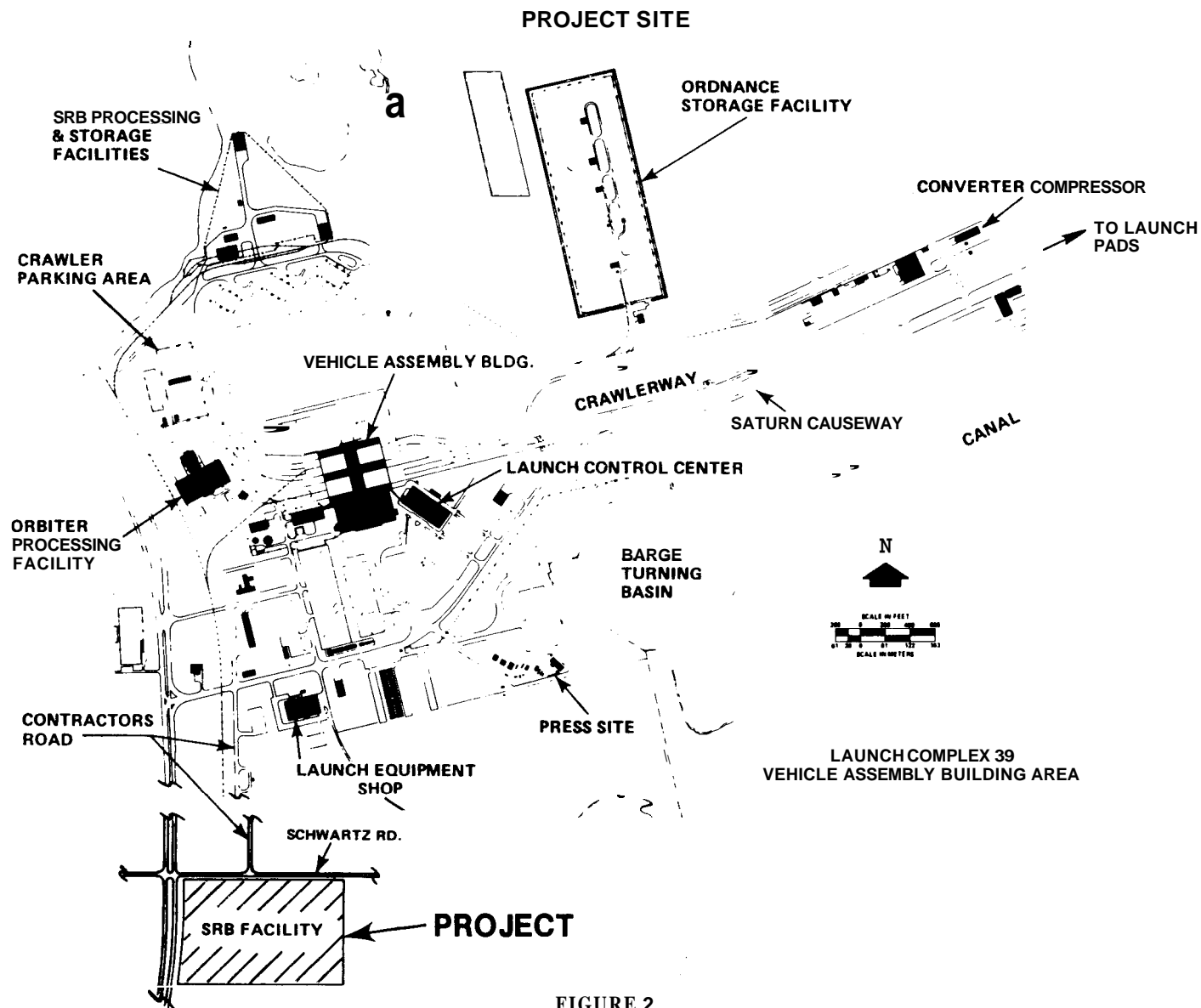


FIGURE 2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

SUMMARY

SPACE SHUTTLE PAYLOAD FACILITIES

Office of Space Flight:

Construction of Additions To Cargo Hazardous Servicing Facility,
Kennedy Space Center.....

Amount

Page No.

4,600,000

CF 3-1

Office of Aeronautics and Space Technology:

Construction of Biomedical Research Facility, Ames
Research Center.....

2,100,000

CF 3-10

Total.....

6,700,000

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF ADDITIONS TO CARGO HAZARDOUS SERVICING FACILITY
LOCATION PLAN

CF 3-1

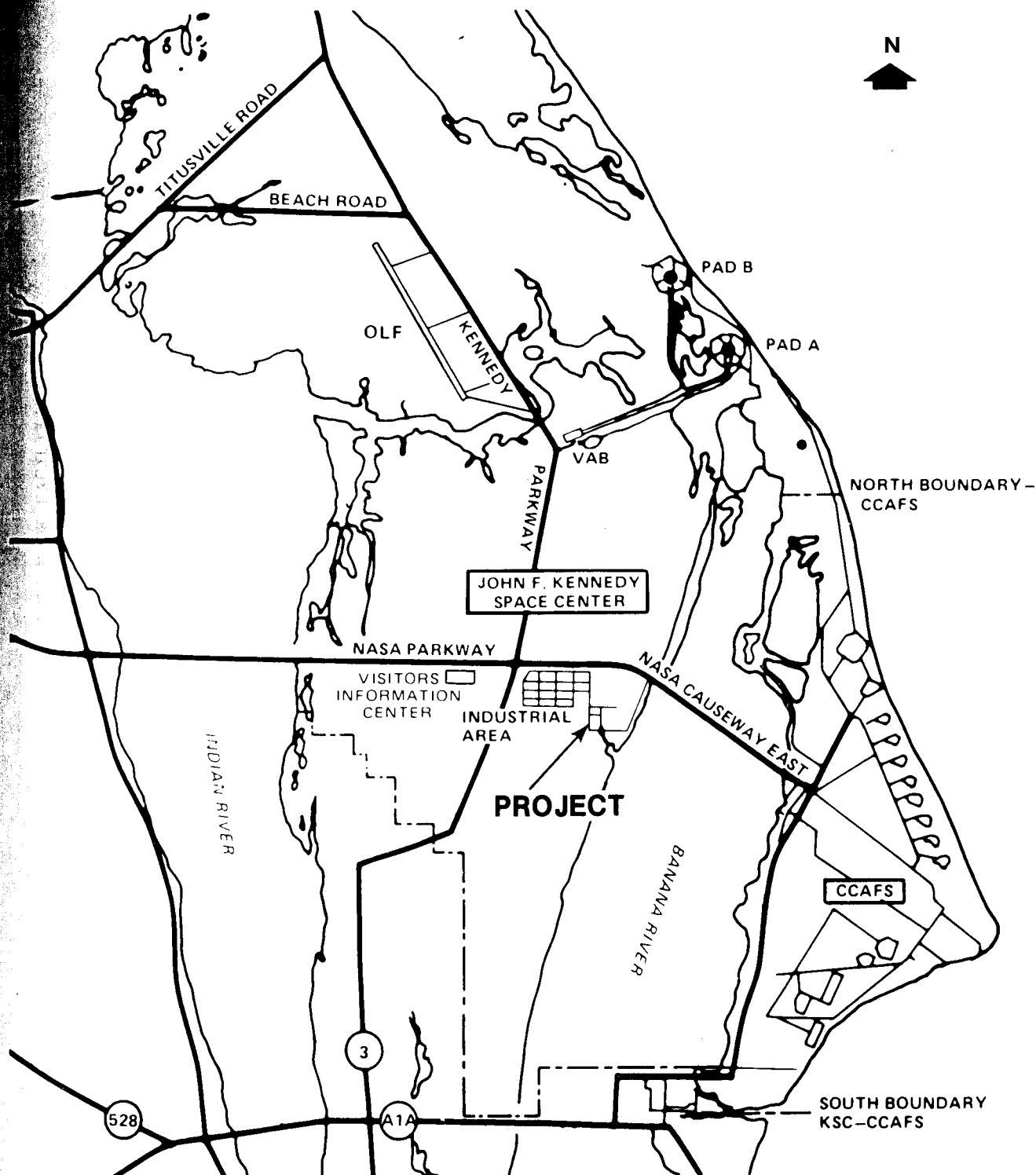


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	Construction of Additions to Cargo Hazardous Servicing Facility
INSTALLATION:	John F. Kennedy Space Center
FY 1985 CoF ESTIMATE: \$4,600,000	

LOCATION OF PROJECT: John F. Kennedy Space Center, Brevard County, Florida

COGNIZANT HEADQUARTERS OFFICE: Office of Space Flight

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF funding	1,058,000	9,000,000	10,058,000
Capitalized investment.....	N/A	---	---
Total.....	<u>1,058,000</u>	<u>9,000,000</u>	<u>10,058,000</u>

SUMMARY PURPOSE AND SCOPE:

This project provides additional capabilities for processing large hazardous cargo in support of the Space Transportation System (STS). The existing facility provides the capability to safely load propellants and explosive ordnance for vertical payloads of the maximum size planned for flight on the STS Orbiters. This project will add an airlock, construct a concrete pad in front of the airlock, provide additional site preparation work, and construct a control building. These additions will allow the payload processing throughput to be increased from the present four payloads per year to eight.

PROJECT JUSTIFICATION:

This project will complete the Cargo Hazardous Servicing Facility. The first phase was included in the FY 1984 CoF program. The FY 1984 project provides an environmentally controlled payload servicing cell for hazardous processing of the largest vertical class payloads that can be carried in the STS Orbiter cargo bay. With this project, an airlock will be provided to preserve the stringent contamination control integrity of the service bay during entrance/exit of a payload. The planned control building will provide an engineering support facility, equipment rooms, SCAPE suit changeout, and payload control rooms. This control building will permit the set up of the communications and control equipment at a safe distance from the servicing cell. After the hazardous processing is completed, unrestricted use of this equipment can be continued for maintaining payload communications and configuration control through launch. Without this capability, the servicing cell could not be used immediately to process a new payload because of the physical presence and usage of the previous payload's communications equipment. The control building is also an essential requirement for remote control and safety monitoring during hazardous processing.

IMPACT OF DELAY:

Delay would result in the inability of KSC to efficiently provide the stringent environmental conditions and control necessary to protect the payloads being processed in the hazardous servicing cell. A control building delay would impact the safe operation of the servicing cell and require continued use of the servicing cell for communications and configuration control after a payload is processed. This would limit the processing throughput to a rate of four payloads per year, which is insufficient to meet projected requirements.

PROJECT DESCRIPTION:

This project provides for construction of a 90-foot high bay entrance airlock of approximately 4,000 square feet, and the construction of a single-story control building enclosing approximately 9,500 square feet with two payload control rooms and supporting engineering and shop space. The airlock will provide a class 100,000 clean room atmosphere for cargo operations. A door approximately 35 feet wide by 75 feet high will be provided to accommodate the cargo canister in a vertical position on its transporter. Also provided in this project is a 35-foot high steel frame payload transporter shed covering 6,600 square feet, and two 16-foot high steel frame tanker sheds, each covering approximately 1,000 square feet.

PROJECT COST ESTIMATE:

This cost estimate is based on a detailed preliminary engineering report.

	Unit of <u>Measure</u>	<u>Quantity</u>	Unit <u>cost</u>	<u>cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>	---	---	---	4,600 ,000
<u>Building</u>	SF	9,486	152.00	1,442,000
<u>Airlock</u>	SF	4,000	471.00	1,884,000
<u>Sitework</u>	SY	8,250	90.06	743,000
<u>Transporter shed</u>	SF	6,600	44.09	291,000
<u>Tanker sheds</u>	SF	2,000	59.00	118,000
<u>Krypton storage</u>	SF	120	183.33	22,000
<u>Antenna tower</u>	LS	---	---	100,000
<u>Equipment</u>	---	---	, ---	---
<u>Fallout Shelter</u> (not feasible).....	---	---	---	---
<u>Total</u>				<u>4,600,000</u>

LIST OF RELATED GRAPHICS:

- Figure 1 - Location Plan
- Figure 2 - Site Plan
- Figure 3 - Site Layout
- Figure 4 - Perspective (of service bay and airlock)
- Figure 5 - Floor Plan (of control building)

OTHER EQUIPMENT SUMMARY:

R&D funding for electrical terminal equipment, interface panels, operational television, operational intercom system, and antennas will be required in the amount of \$990,000.

FUTURE COF FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

**JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF ADDITIONS TO CARGO HAZARDOUS SERVICING FACILITY**

SITE PLAN

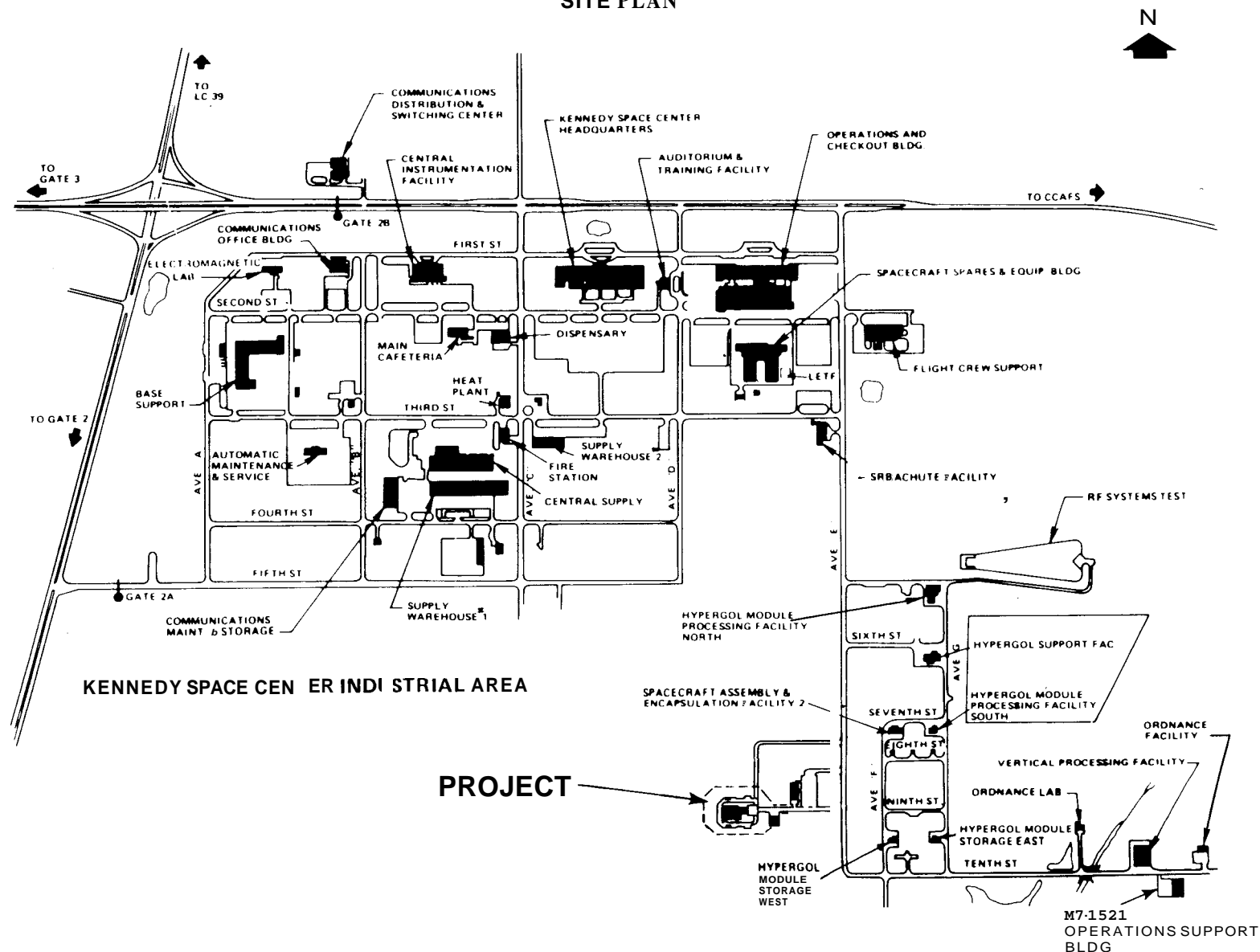


FIGURE 2

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF ADDITIONS TO CARGO HAZARDOUS SERVICING FACILITY

SITE LAYOUT

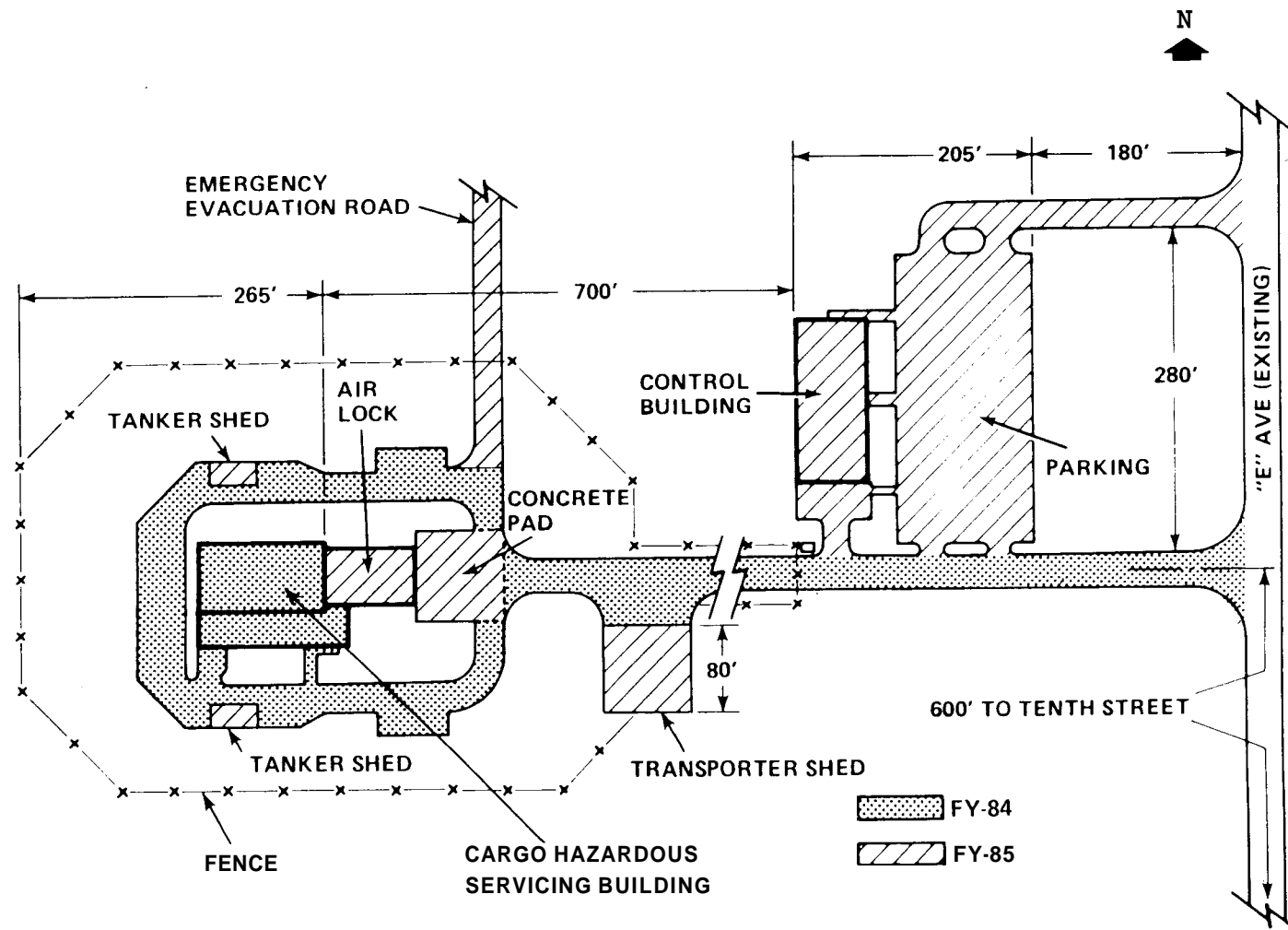


FIGURE 3

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF ADDITIONS TO CARGO HAZARDOUS SERVICING FACILITY

PERSPECTIVE

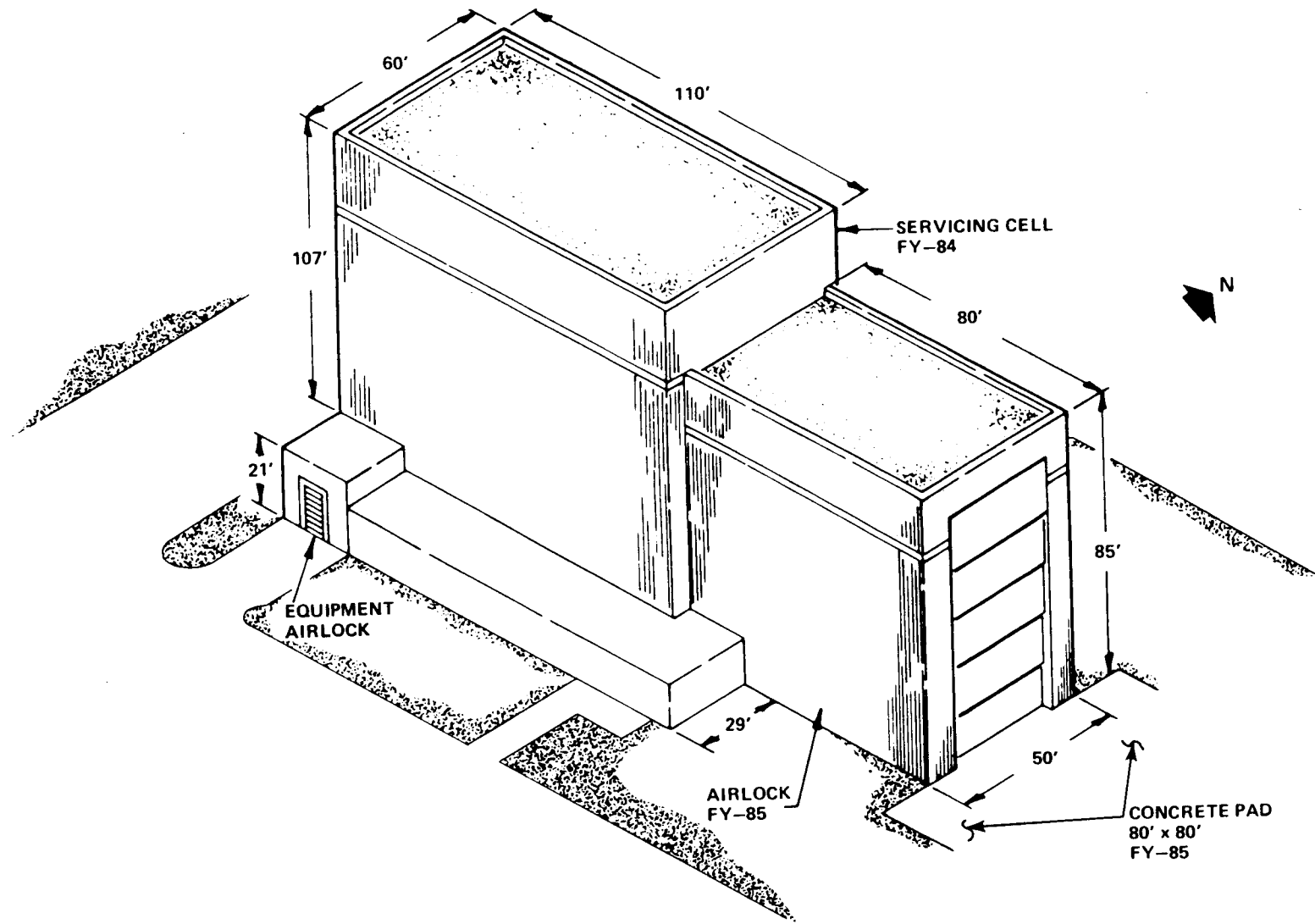
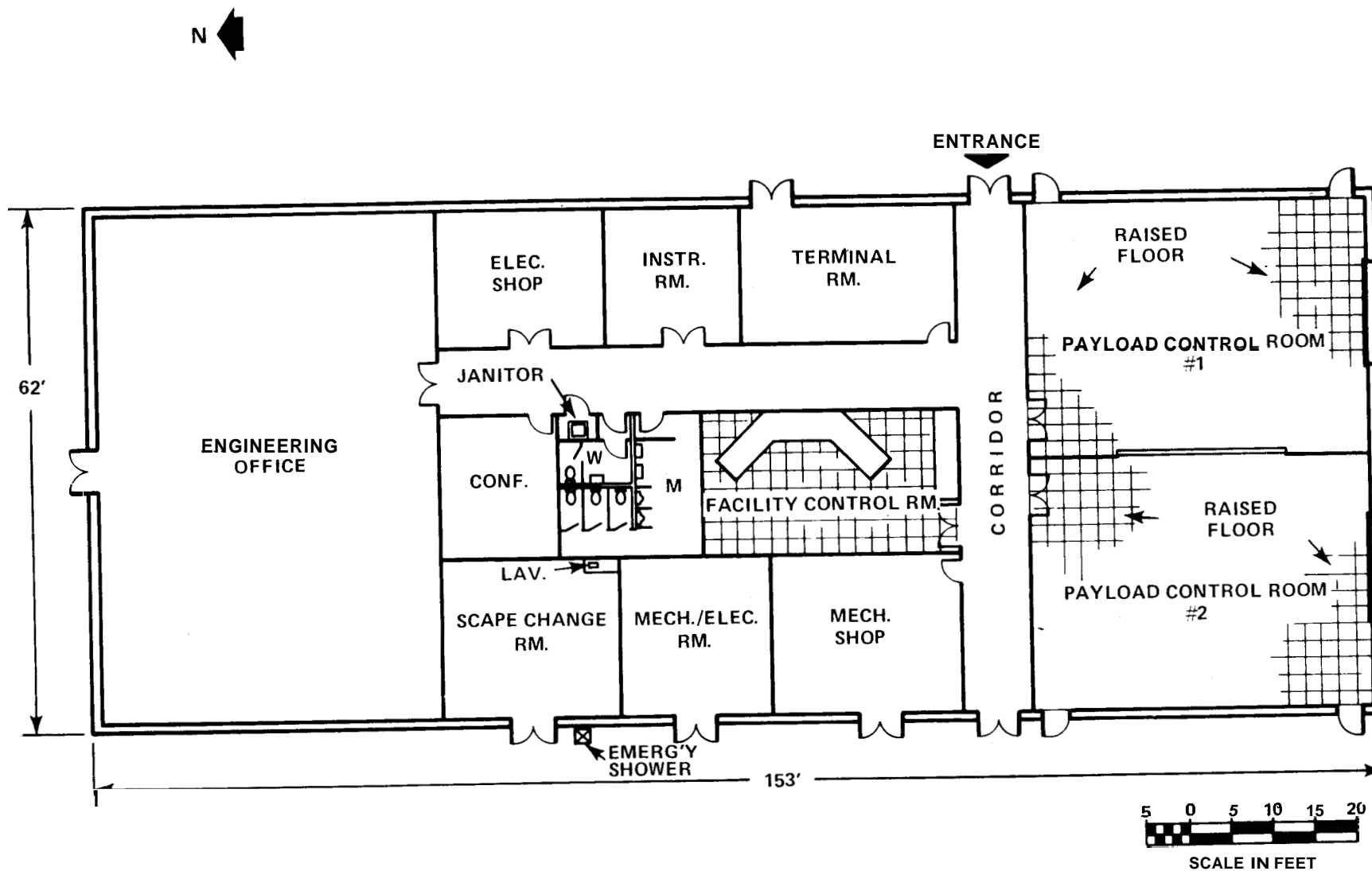


FIGURE 4

JOHN F. KENNEDY SPACE CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF ADDITIONS TO CARGO HAZARDOUS SERVICING FACILITY

FLOOR PLAN



CONTROL BUILDING
FIGURE 5

CF 3-9

AMES RESEARCH CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF BIOMEDICAL RESEARCH FACILITY

LOCATION PLAN

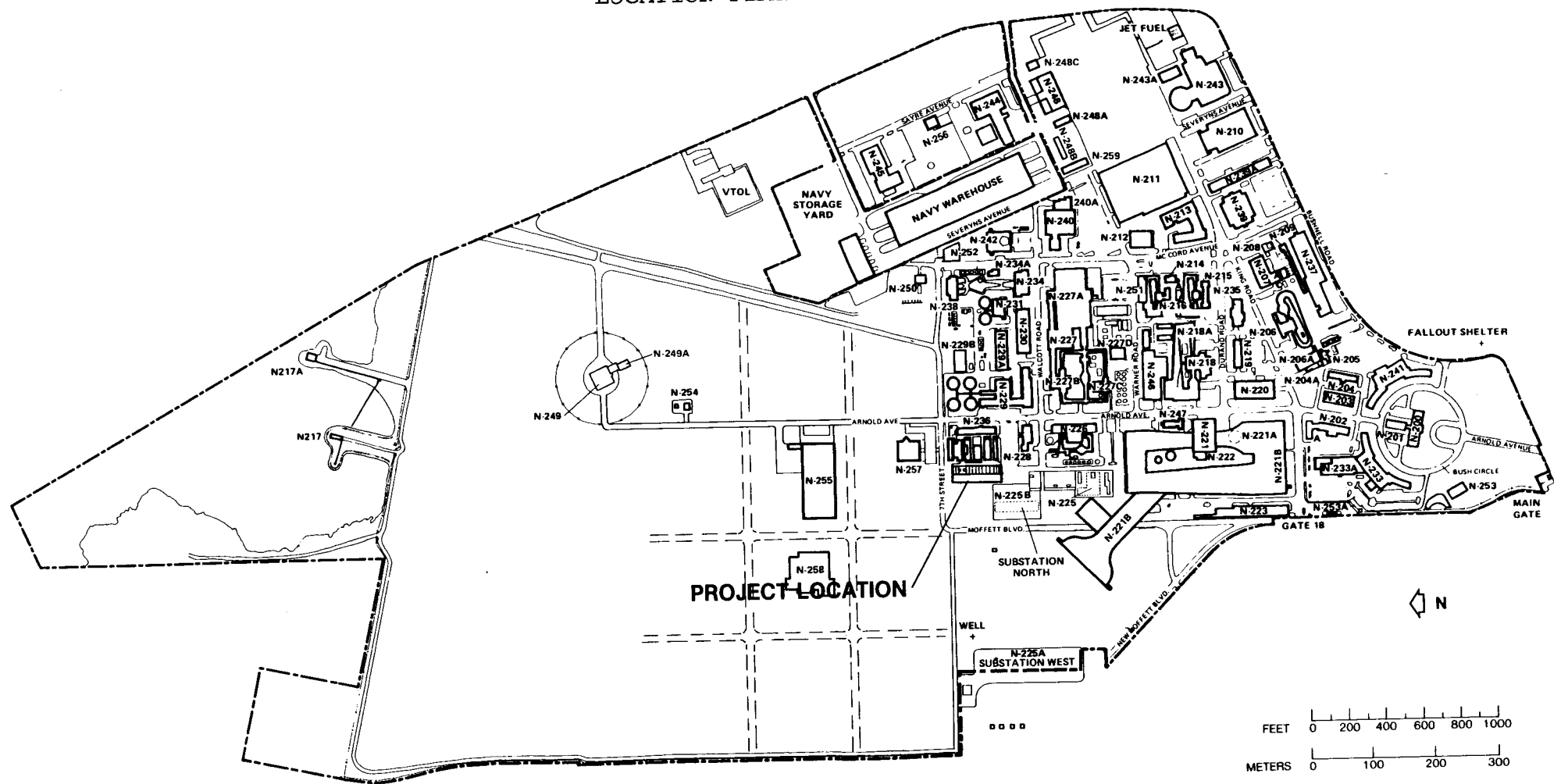


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	<u>Construction of Biomedical Research Facility</u>
INSTALLATION:	<u>Ames Research Center</u>
	<u>\$2,100,000</u>

LOCATION OF PROJECT: Moffett Field, Santa Clara County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF funding.....	191,300	551,000	742,300
Capitalized investment.....	<u>N/A</u>	<u>2,336,286</u>	<u>2,336,286</u>
Total.....	<u>191,300</u>	<u>2,887,286</u>	<u>3,078,586</u>

SUMMARY PURPOSE AND SCOPE:

Ames Research Center (ARC) has been designated as the NASA lead center for all animal experiments for the Space Lab Program. In addition to this specific life science effort, ARC conducts aerospace experimentation and research over a broad spectrum of biomedical disciplines. Current laboratory and support facilities associated with the ARC Animal Care Facility (ACF) are a makeshift collection of aging trailers that are expensive to maintain, unsightly, and substandard for animal care and occupational safety. This project provides for the construction of a 21,000 square foot building to replace the current trailer complex (Figures 1 and 2).

CF 3-11

PROJECT JUSTIFICATION:

The current trailer complex at Building N-236 is a hodgepodge arrangement of trailers purchased in the 1960's for other programs. These trailers are now used for laboratories, animal housing, animal food and bedding storage, offices, and service areas. Due to the limitations of trailers and their aging condition, this facility is inadequate for meeting NASA's current key needs and is expensive to maintain. The highest cost aspects are maintaining individual trailer heating and cooling systems and repair of leaking roofs. Construction of an adequate facility to replace the trailer complex will save high maintenance and repair costs as well as provide the necessary flexible and efficient capability to meet vital requirements of the Life Sciences Program. The new building will provide needed laboratory space to meet flight and research program priorities and ACF support facilities consistent with humane animal care requirements.

The facility will be used by flight program investigators, in-house research personnel, and support for the ACF. It will provide laboratory capability to conduct ground-based studies leading to and in support of flight experiments. The facility will also provide needed space for ARC research personnel presently housed in the over-crowded bioscience laboratory. Relocating to the new research building, in close proximity to the ACF, will greatly enhance NASA's ability to obtain and keep accreditation for animal care and use, and improve the quality of animal research.

IMPACT OF DELAY:

This project is required at the earliest date possible because the substandard conditions and rapid deterioration of the current trailer complex will impair the effective meeting of milestones of flight and research programs.

PROJECT DESCRIPTION:

This project provides for the construction of approximately 21,000 square feet of laboratory and support facilities to replace 18 obsolete trailers and 1 environmental chamber. The facility will include 6,700 square feet of support facility space and 10,500 square feet of research laboratory and office space. The proposed building will be located south of and adjacent to the existing ACF where the substandard trailers are now located.

PROJECT COST ESTIMATE:

This cost estimate is based on a preliminary engineering report.

	Unit of <u>Measure</u>	<u>Quantity</u>	<u>Unit</u> <u>cost</u>	<u>cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>	---	---	---	2,100,000
Site preparation.....	LS	---	---	240,000
Architectural/structural.....	SF	21,000	63.80	1,340,000
Mechanical.....	SF	21,000	12.85	270,000
Electrical	SF	21,000	11.90	
<u>Equipment</u>	---	---	---	---
<u>Fallout Shelter</u> (not feasible).....	---	---	---	---
Total.....				2,100,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Floor Plan

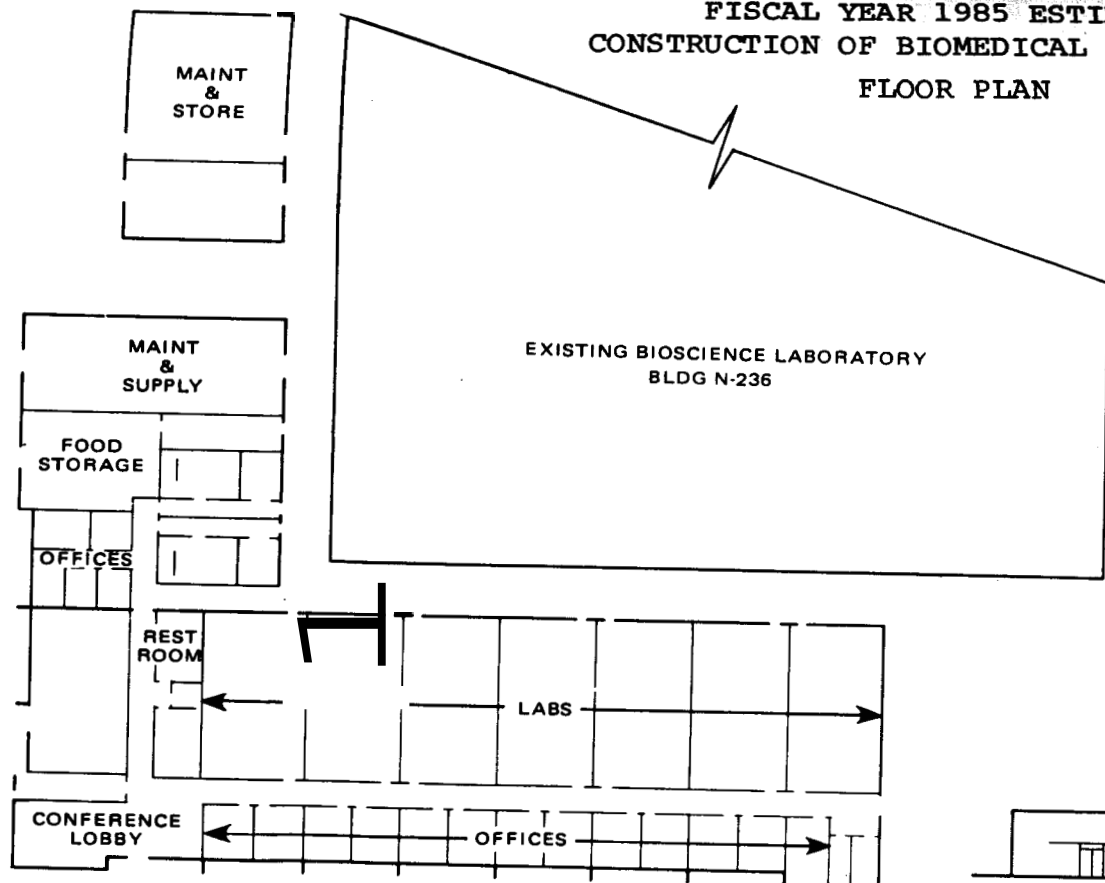
OTHER EQUIPMENT SUMMARY :

No other equipment is required to complete this project.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

AMES RESEARCH CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF BIOMEDICAL RESEARCH FACILITY
FLOOR PLAN



FLOOR PLAN

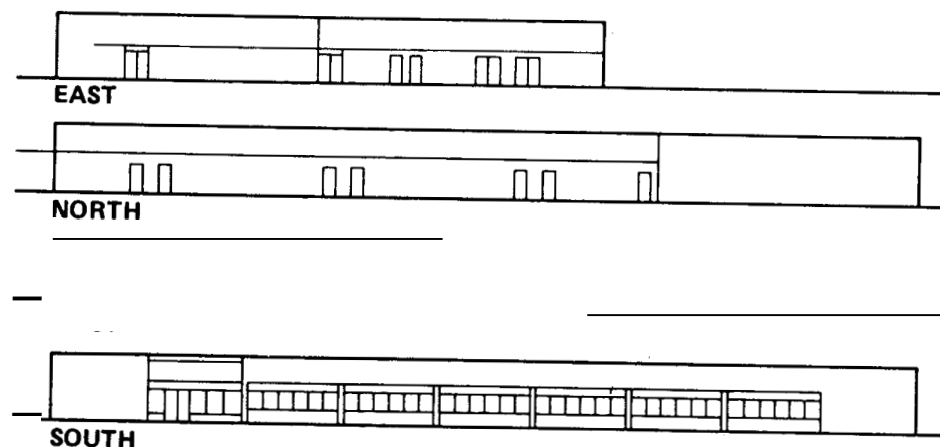


FIGURE 2

CF 3-14



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL, YEAR 1985 ESTIMATES

SUMMARY

GODDARD SPACE FLIGHT CENTER

Office of Space Tracking and Data Systems:

Amount

Page No.

Construction of Addition to the Network Control Center

2,200,000

CF 4-1

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF ADDITION TO THE NETWORK CONTROL CENTER

LOCATION PLAN

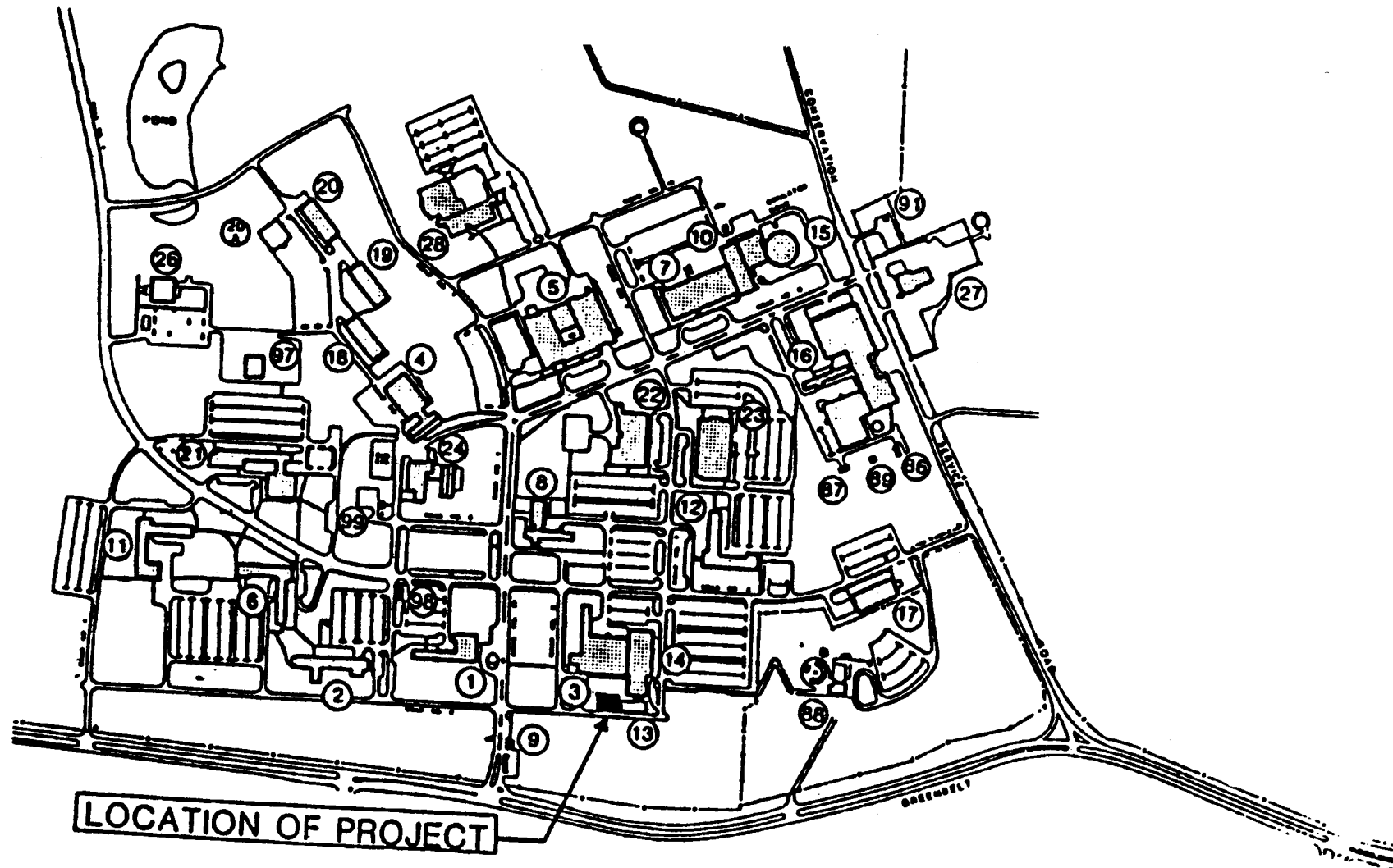


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	Construction of Addition to the Network Control Center
INSTALLATION:	Goddard Space Flight Center
	FY 1985 CoF ESTIMATE: \$2,200,000*

*NOTE: This is the NASA portion of a jointly funded NASA/DOD facility project.

LOCATION OF PROJECT: Greenbelt, Prince George's County, Maryland

COGNIZANT HEADQUARTERS OFFICE: Office of Space Tracking and Data Systems

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF finig	**164,000	---	164,000
Capitalized investment.....	<u>N/A</u>	<u>1,481,620</u>	<u>1,481,620</u>
Total.....	<u>164,000</u>	<u>1,481,620</u>	<u>1,645,620</u>

**Note: NASA's portion of planning and design.

SUMMARY PURPOSE AND SCOPE:

This project provides for the construction of a two-story 32,000-square foot addition to the Network Control Center (NCC) required for the Tracking and Data Relay Satellite System (TDRSS). This addition is necessary to provide essential equipment and work space for technical and support functions for NASA and the Department

of Defense (DOD). The NCC is the computer based scheduling and control system for the TDRSS and the TDRSS. Operational support equipment and related NCC activities require the use of the building utility systems. Because DOD security requirements are embedded in the overall system, the NCC must conform to DOD security standards.

The project is sponsored jointly by NASA and the United States Air Force (USAF) at a total estimated cost of \$5,700,000. NASA will provide \$2,200,000 and the USAF will provide \$3,500,000. NASA and the USAF will share in the planning and design costs by providing \$164,000 and \$240,000 respectively. Title to this facility addition will be vested with NASA (GSFC).

PROJECT JUSTIFICATION:

The TDRSS is assuming tracking, command, and data acquisition support functions previously provided by the Spaceflight Tracking and Data Network (STDN) for low earth orbiting spacecraft. The NCC at GSFC is a critical element in TDRSS operations, providing 24 hours per day, 7 days per week scheduling for individual spacecraft support and on-line control of the TDRSS to meet user requirements. These requirements include emergency support as well as scientific and other purposes. This scheduling and control function involves complex computer operations, supported by extensive computer software development and maintenance.

Development of the NCC from inception to the current configuration now needed for full and secure TDRSS operations has led to requirements for additional facility space. The necessary equipment has overcrowded the present facility and exceeded the electrical power and air conditioning capability. Similarly, added support for DOD operations has increased in complexity, and now involves more functions that must be contained within the secure NCC envelope. DOD security requirements necessitate additional space adjacent to the NCC. The space requirements to be provided by this project are based on the actual computer systems and related equipment to be installed, the level of security required by DOD activities, the supporting utility systems needed for the equipment, and the necessary level of redundancy appropriate for uninterrupted TDRSS mission support operations.

IMPACT OF DELAY:

This addition must be constructed in FY 1985 to provide the reliable utility support for essential NCC systems that are required by May 1986, and to provide needed space for support functions that must be located in the NCC secure areas by that time. Delay of construction would preclude establishing the reliable TDRSS operational capability when required, and impede NCC system support activities that must be established within the DOD secure area.

PROJECT DESCRIPTION:

This project will provide for the construction of a 32,000-square foot, two-story addition to Building 13 (Figures 3 and 4). The addition will be of brick construction with a structural steel frame supported on a drilled caisson foundation system. The first floor will provide space for automatic data processing equipment (ADPE) staging, NCC materials entry and exit handling, equipment maintenance, ADPE hardware support, logistics for critical spare parts and supplies, mechanical and electrical building equipment, and facilities operations support.

The second floor will provide space for computer systems development, documentation storage, secure text processing, secure tape storage, operations references and planning, operations management, software support, and mechanical, electrical and telephone equipment. Cable ductbanks will be extended from the existing ductbank network and the utilities will be provided from available systems.

PROJECT DESCRIPTION:

This project will provide for the construction of a 32,000-square foot, two-story addition to Building 13 (Figures 3 and 4). The addition will be of brick construction with a structural steel frame supported on a drilled caisson foundation system. The first floor will provide space for automatic data processing equipment (ADPE) staging, NCC materials entry and exit handling, equipment maintenance, ADPE hardware support, logistics for critical spare parts and supplies, mechanical and electrical building equipment, and facilities operations support.

The second floor will provide space for computer systems development, documentation storage, secure text processing, secure tape storage, operations references and planning, operations management, software support, and mechanical, electrical and telephone equipment. Cable ductbanks will be extended from the existing ductbank network and the utilities will be provided from available systems.

PROJECT COST ESTIMATE:

This cost estimate is based on a preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>	---	---	---	5,700,000
Utilities.....	LS	---	---	720,000
Site work.....	LS	---	---	115,000
Architectural/structural.....	SF	32,000	77.50	2,480,000
Mechanical.....	SF	32,000	38.75	1,240,000
Electrical.....	SF	32,000	28.63	916,000
Fire protection..	SF	32,000	7.16	229,000
<u>Equipment</u>	---	---	---	---
<u>Fallout Shelter</u> (not feasible).....	---	---	---	---
Total.....				5,700,000
NASA Funding (this budget request).....			2,200,000	
USAF Funding			3,500,000	
Total.....			5,700,000	

LIST OF RELATED GRAPHICS:

- Figure 1 - Project Location Plan
- Figure 2 - Site Plan
- Figure 3 - First Floor Plan
- Figure 4 - Second Floor Plan

OTHER EQUIPMENT SUMMARY:

ADPE and other related equipment, estimated to cost \$7,000,000 are being provided with FY 1984 and prior year non-CoF funding.

FUTURE CoF ESTIMATE FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

GODDARD GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF ADDITION TO THE NETWORK CONTROL CENTER

SITE PLAN

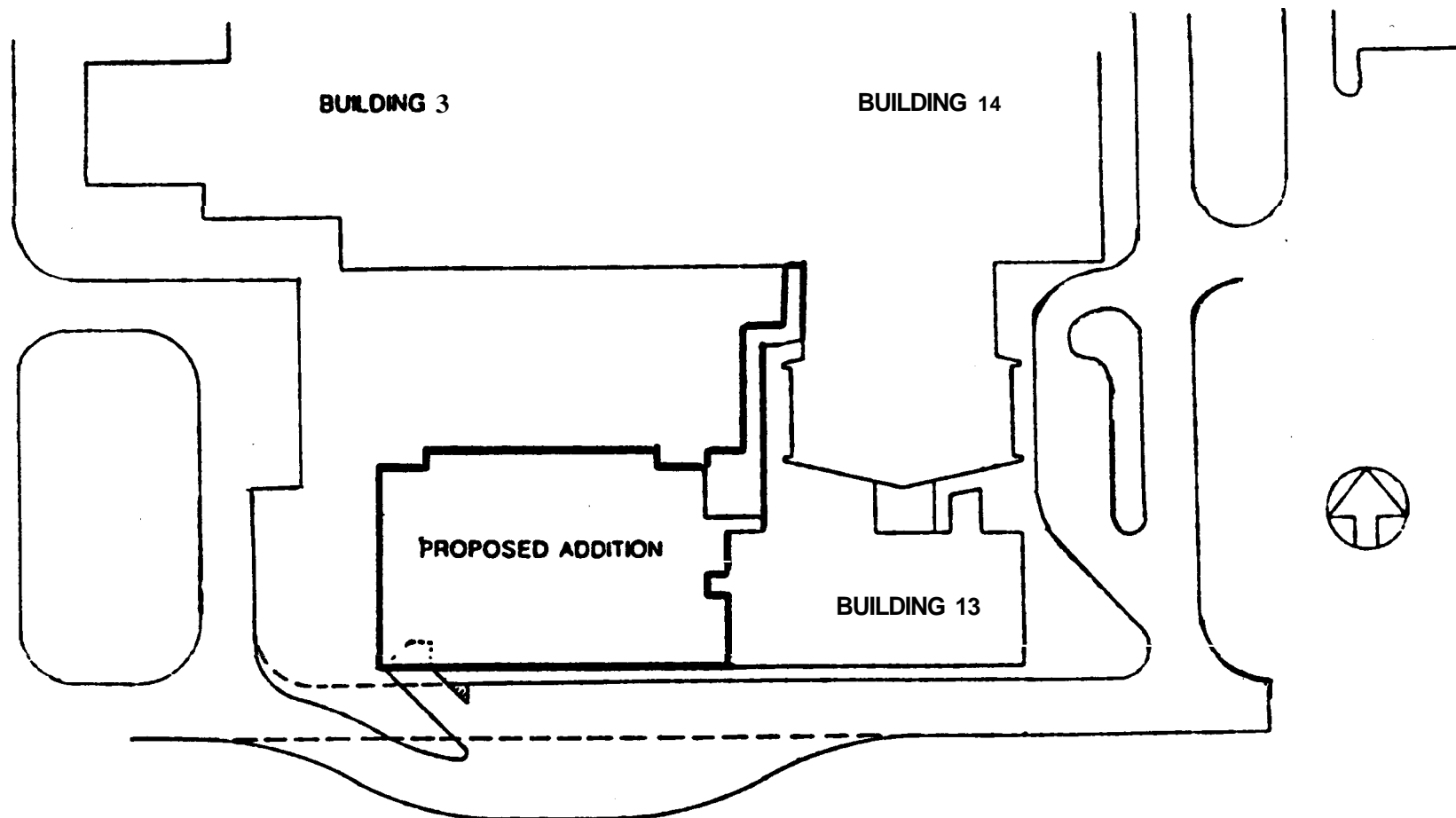


FIGURE 2

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF ADDITION TO THE NETWORK CONTROL CENTER

FIRST FLOOR PLAN

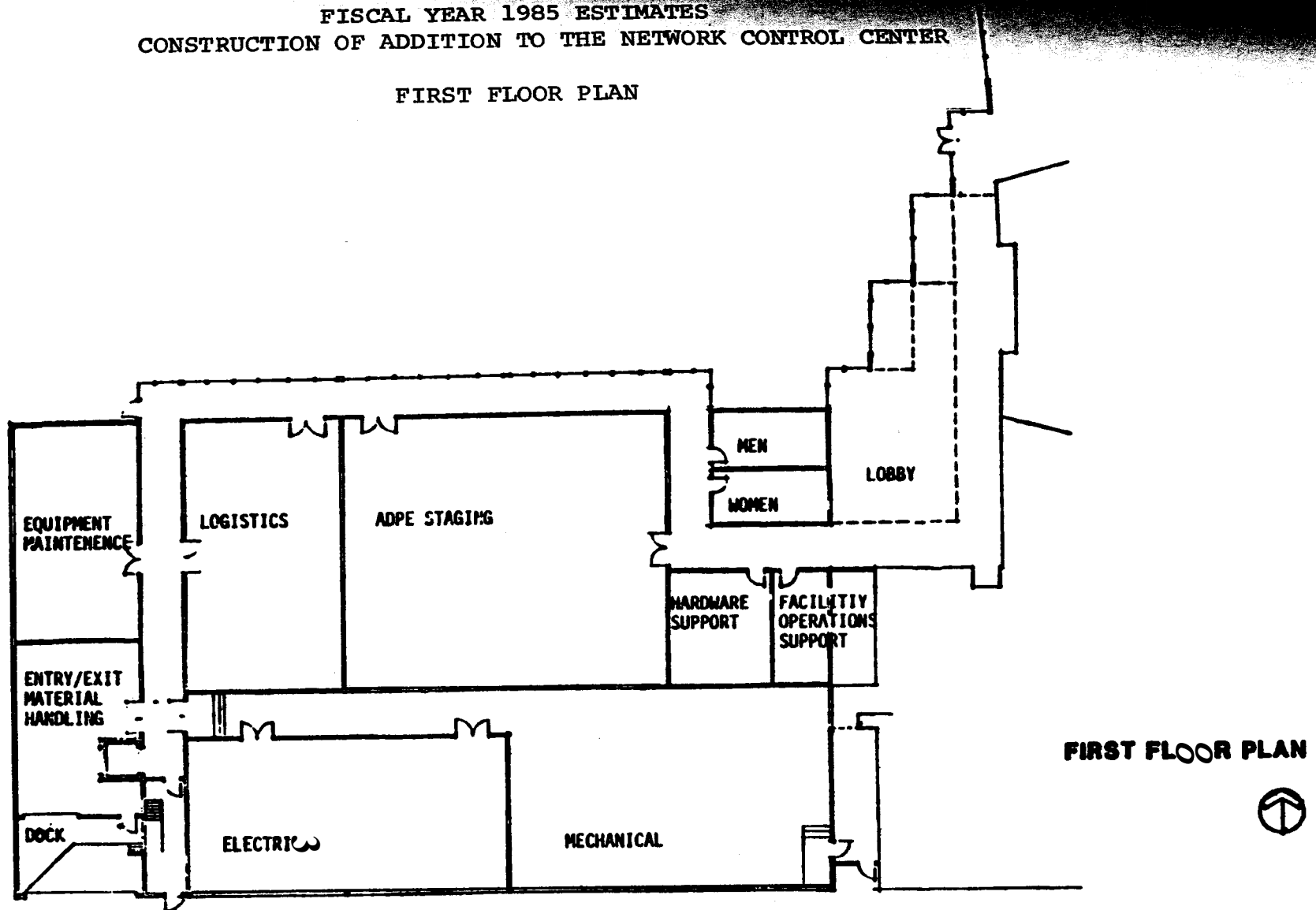


FIGURE 3

GODDARD SPACE FLIGHT CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF ADDITION TO THE NETWORK CONTROL CENTER

SECOND FLOOR PLAN

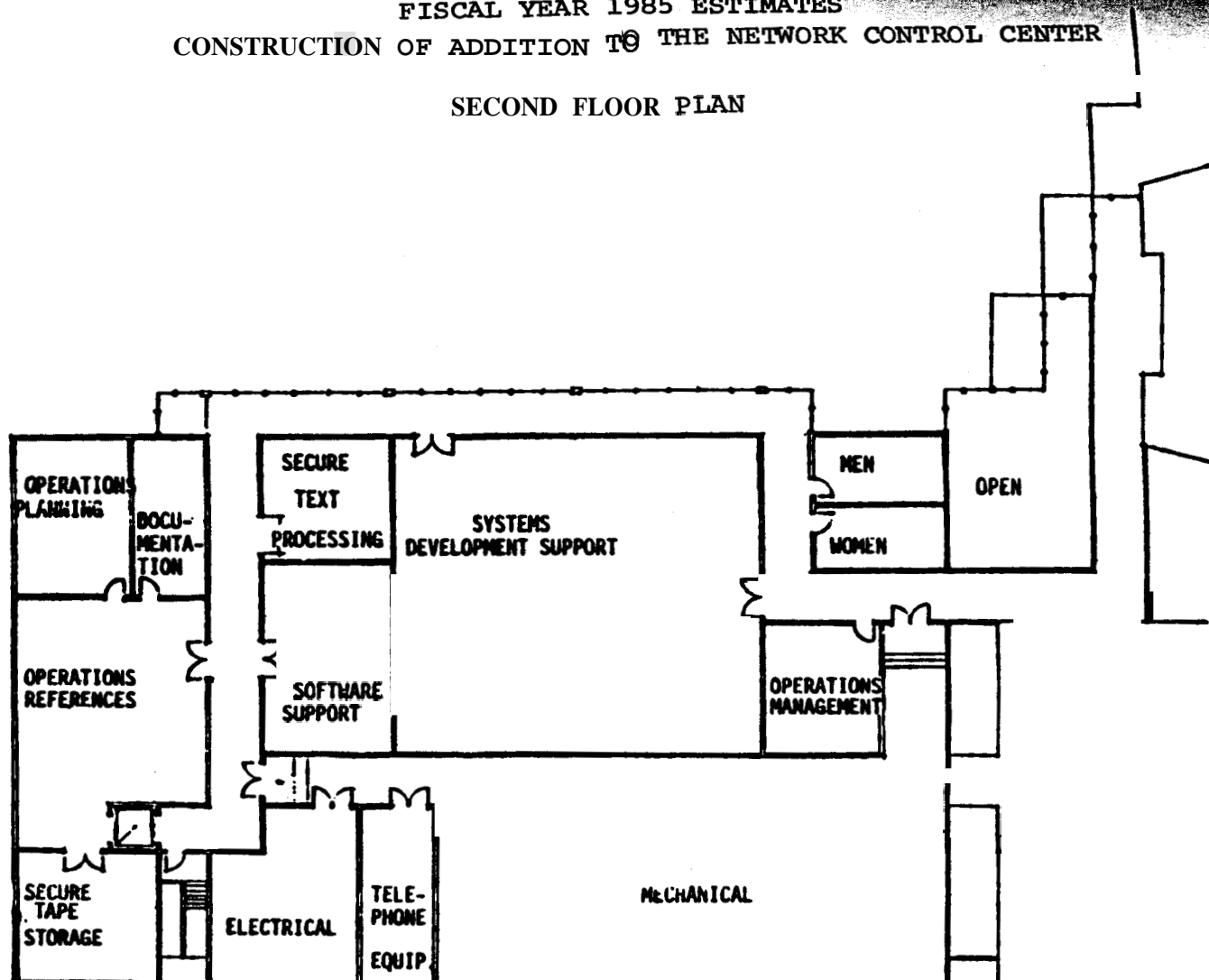


FIGURE 4

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

SUMMARY

JET PROPULSION LABORATORY

<u>Office of Space Science and Applications:</u>	<u>Amount</u>	<u>Page No.</u>
Construction of Earth and Space Science Laboratory.....	<u>12,200,000</u>	CF 5-1

JET PROPULSION LABORATORY
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF EARTH AND SPACE SCIENCE LABORATORY

LOCATION PLAN

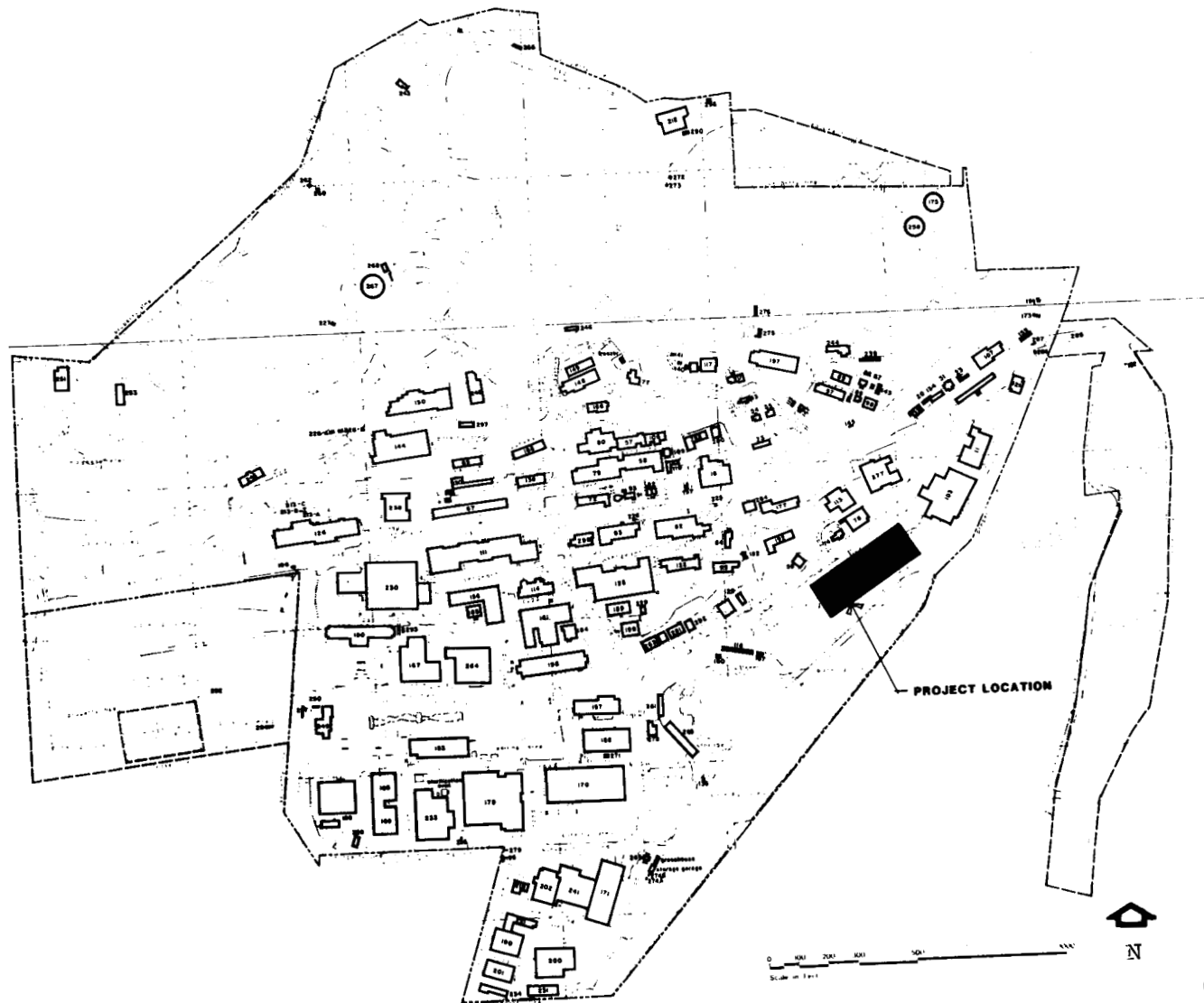


FIGURE 1

CF 5-1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE: Construction of Earth and Space Science Laboratory

INSTALLATION: Jet Propulsion Laboratory

FY 1985 CoF ESTIMATE: \$12,200,000

LOCATION OF PROJECT: La Canada-Flintridge, Los Angeles County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Space Science and Applications

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF funding.....	940,000	---	940,000
Capitalized investment.....	<u>N/A</u>	<u>---</u>	<u>---</u>
Total.....	<u>940,000</u>	<u>---</u>	<u>940,000</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the construction of an Earth and Space Science Laboratory at the Jet Propulsion Laboratory (JPL). This facility is required to house the equipment and activities of 295 scientific, engineering and other personnel working on rapidly expanding radar, oceans, and electronic component development and test programs. The building will be a two-story structure of approximately 90,000 square feet composed of laboratory, computer, test, and associated technical support space. It will provide facilities to accommodate imminent program expansions and required improved conditions for the development, testing and evaluation of unique spacecraft component systems.

PROJECT JUSTIFICATION:

JPL is assigned responsibility for NASA deep space scientific exploration, tracking and data acquisition, and the development of spacecraft. Radar and oceanography activities being conducted by JPL include the Shuttle Imaging Radar (SIR), the Venus Radar Mapper (VRM), Ocean Data Archives, and other activities in the development process. In addition, spacecraft design requirements have placed an increased demand on the development test and integration of micro-electronic systems using large scale (LSI), very large scale (VLSI) and very high speed integrated circuits (VHSIC). The application of these complex and unique electronic components in spacecraft systems requires research and evaluation which exceeds the present capabilities of JPL, other NASA centers, and industry.

Successful accomplishment of radar and ocean program activities involves an increase in personnel from 128 to about 230 by 1986 with a budget increase in excess of \$50.0 million. In addition, \$3.0 million of instruments and test systems to support the demanding test and analysis requirements of VRM, SIR and future spacecraft systems are being acquired. This equipment requires stringent temperature and humidity controlled environment, clean rooms, and electrostatic protection for effective operation.

Presently these spacecraft development activities are inadequately housed in more than ten buildings and trailers which are scattered about the laboratory. The existing space is over-crowded and cannot be economically expanded to accommodate the necessary test and data analysis equipment that is being acquired, and it cannot be modified for adequate clean room environment and temperature and humidity control. Colocation of radar, oceans, and electronic component development personnel will facilitate information exchange, eliminate duplication of facilities, and reduce administrative costs.

Site conditions at JPL are such that a two-story laboratory of this size with computers and test equipment on the first level and supporting functions on the second level is the most cost effective design for satisfying the requirement.

IWACT OF DELAY

Delay in providing this project will seriously impact the expansion of the vital radar and oceanography activities and seriously affect the ability of JPL to respond to development and evaluation of the sophisticated electronic systems that are required for future spacecraft.

CF 5-3

PROJECT DESCRIPTION:

This project provides for the construction of a two-story laboratory facility of approximately 90,000 square feet. The facility will be located on Mariner Road southwest of the Fabrication Shop, Building 103 (Figure 1). Site development work includes extending the existing utilities to the building, paving, and exterior lighting.

The building will be of steel frame construction with a metal roof deck and a reinforced concrete slab on grade. The first floor will include electronics, test laboratories, and computer, data processing and simulation spaces. The second floor will accommodate LSI, VLSI, and VHSIC test laboratories, radar data archives and analysis laboratory, and technical support space. The laboratories will be provided with precise temperature and humidity controls. Two high bay laboratories and the mechanical and electrical equipment rooms are also included. An overhead raceway distribution system for telephone, computer, and data communications systems will be provided. Special systems include appropriate shielding, approximately 20,000 square feet of computer flooring, necessary electronic grounding, and heat exhaust systems for the computer equipment.

PROJECT COST ESTIMATE:

This cost estimate is based on a preliminary engineering report.

	Unit of Measure	Quantity	Unit cost	cost
Land Acquisition.....	---	---	---	---
Construction.....	---	---	---	12,200,000
Site work.....	LS	---	---	1,305,000
Architectural/structural.....	SF	go, 000	56.00	5,040,000
Mechanical.....	LS	---	---	3,110,000
Electrical.....	LS	---	---	2, 185,000
Special systems.....	LS	---	---	560,000
Equipment..	---	---	---	---
Fallout Shelter (not feasible).....	---	---	---	---
Total.....				12,200,000

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan
Figure 2 - Site Plan

OTHER EQUIPMENT SUMMARY:

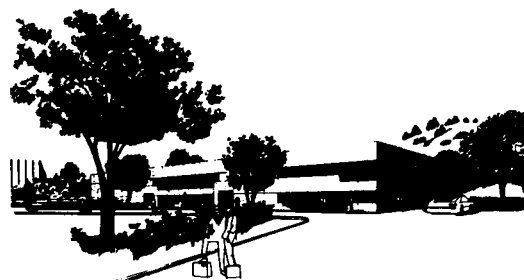
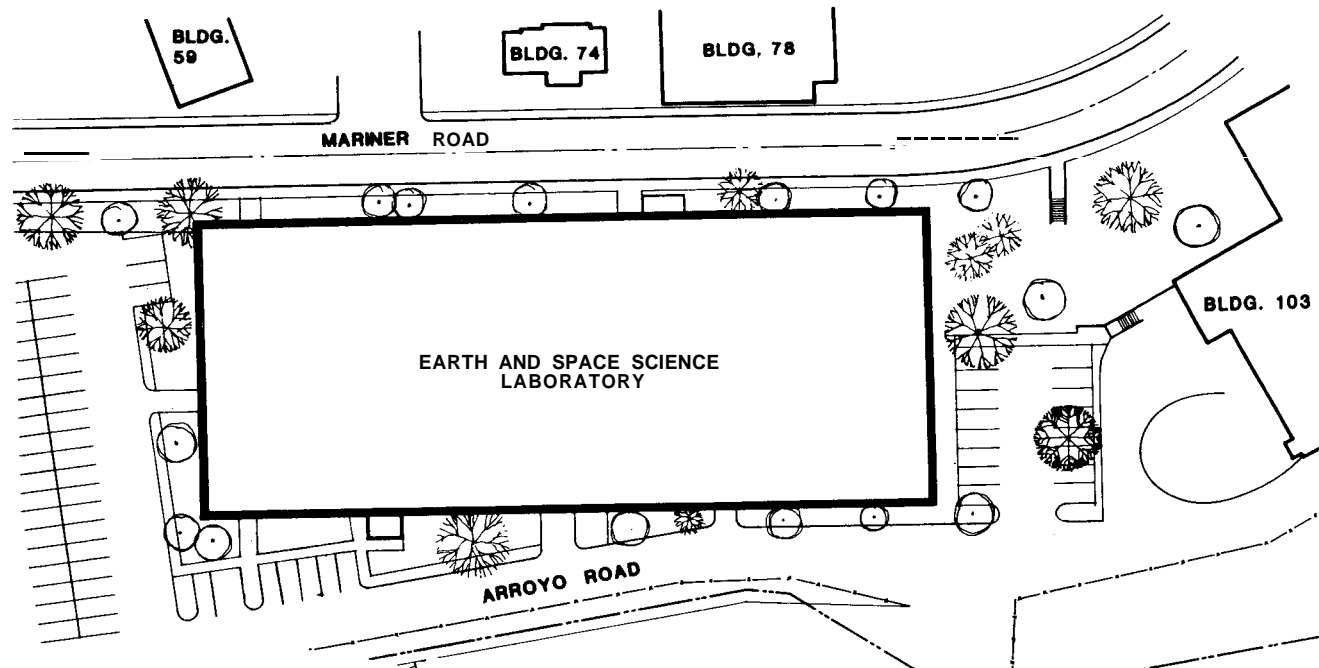
Approximately \$3 million of R&D funded test equipment is required to complete this project.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

JET PROPOSAL FOR
FISCAL YEAR 1985 ESTIMATE
CONSTRUCTION OF EARTH AND SPACE SCIENCE LABORATORY

SITE PLAN



RENDERING

CF 5-6

FIGURE 2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

SUMMARY

AMES RESEARCH CENTER

	<u>Amount</u>	<u>Page No.</u>
<u>Office of Aeronautics and Space Technology :</u>		
Construction of Numerical Aerodynamic Simulation Facility,.....	<u>16,500,000</u>	CF 6-1

AMES RESEARCH CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF NUMERICAL AERODYNAMIC SIMULATION FACILITY

LOCATION PLAN

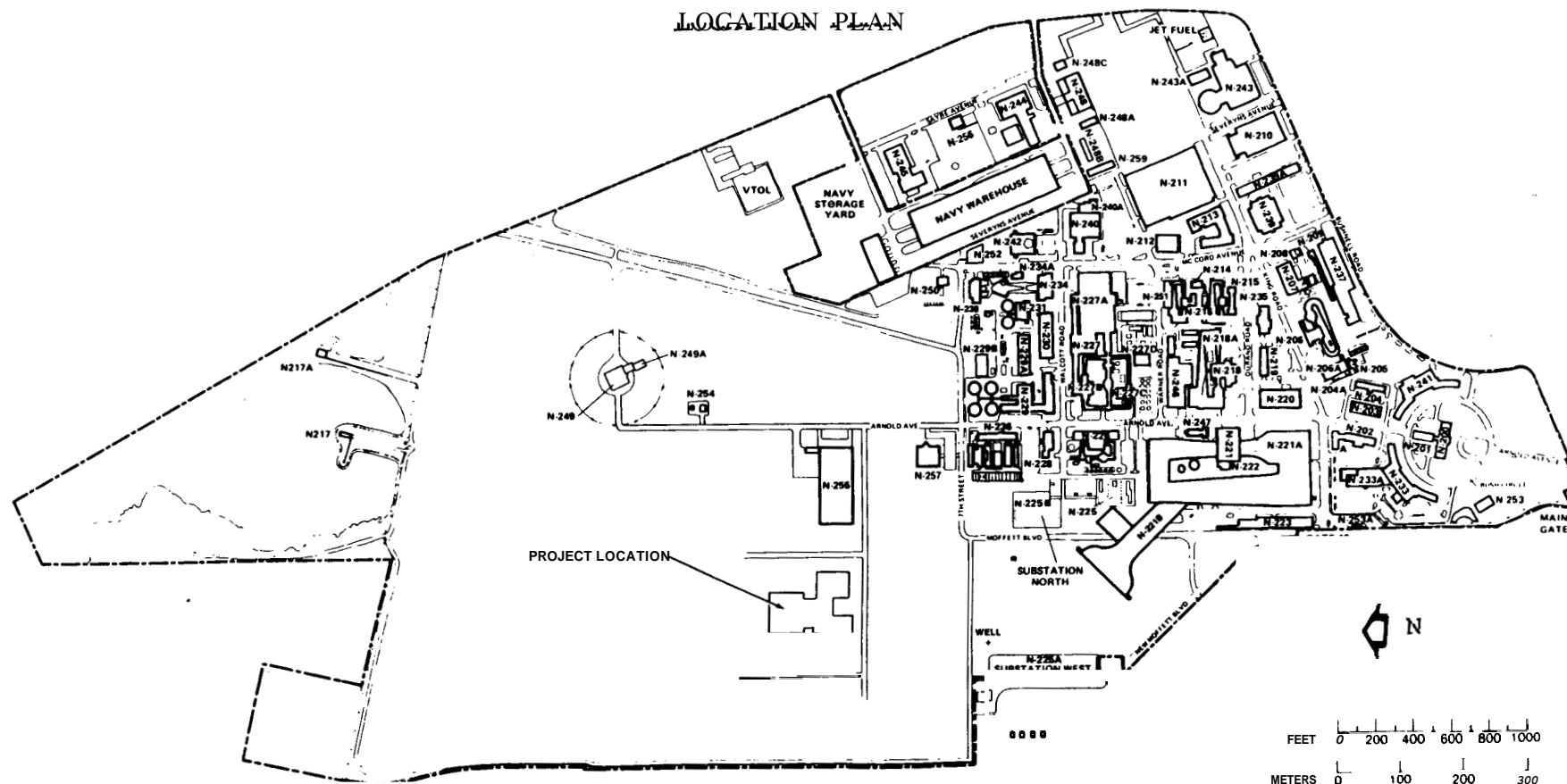


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	<u>Construction of Numerical Aerodynamic Simulation Facility</u>		
INSTALLATION:	<u>Ames Research Center</u>		
	FY 1985 CoF ESTIMATE:	<u>\$16,500,000</u>	

LOCATION OF PROJECT: Moffett Field, Santa Clara County, California

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF funding.. .. .	1,050,000	---	1,050,000
Capitalized investment.....	N/A	---	---
Total.....	<u>1,050,000</u>	<u>---</u>	<u>1,050,000</u>

SUMMARY PURPOSE AND SCOPE:

The Numerical Aerodynamic Simulation (NAS) program is an integral element of NASA's aerodynamic research and development capability. The NAS activity will provide and maintain a leading computational capability for NASA, other Government agencies, industry, and universities. The NAS processing system network will offer an advanced high-speed computational capability for aerodynamic research, aeroelastic simulation, solving viscous 3-D fluid flow equations and advanced fluid physics research. This project provides the facility to house the

computational system, support areas, and space for operations, development, resident research, and maintenance staff. Space will also be provided for the system development staff, who will be available for necessary upgrading of the NAS Processing System Network (NPSN).

PROJECT JUSTIFICATION:

The NAS Processing System Network (NPSN) will be an integrated network of state-of-the-art computer systems designed to provide a full range of numerical simulation. It will be a continually evolving system incorporating the latest advancements in scientific supercomputers. As an element of NASA's Numerical Aerodynamic Simulation Program, this system will provide a simulation capability to support advanced fluid dynamic and aerodynamic research, development, test, and evaluation. Advanced design objectives of future aircraft, such as negative static stability and automatic aerodynamic tailoring, require very high speed computation of great complexity and very large data capacity. This capability does not now exist in NASA. For mathematical modeling of aircraft of the future, the described computational capability must be available. The system will also support the solution to other complex problems of interest to NASA, including such fields as meteorology, climate research, structural analysis, and computational chemistry.

To be successful, the NPSN must be situated so that there is interaction between the researchers who identify and specify requirements, the development staff who translate the requirements into machine format, the operations staff, and the maintenance staff. The computer equipment will demand unique power and cooling requirements. Adequate facilities must be provided for this advanced, high-speed computer system. In addition, the computer system must be housed in a secure environment. The proposed facility will satisfy these requirements.

IMPACT OF DELAY:

Delay of this project will result in the continued housing of initial computer equipment in temporary space. Research, operations, and maintenance personnel will not be colocated with the equipment which will result in more costly and inefficient operations. The majority of the computer equipment for the NAS, scheduled for delivery in FY 1986 and 1987, cannot be housed or supported in existing facilities. The development of the ultimate capability of this system will similarly be delayed.

PROJECT DESCRIPTION:

The project (Figure 2) provides a 90,500 square foot, two-story building to house the NAS Processing System Network, associated peripheral equipment, and secure computer equipment. Special power conditioning, emergency power, utilities management, and process cooling will be installed.

The necessary physical security and fire protection systems will also be provided. Approximately 10,000 square feet will be used for computers and computer support. Research, development, operations, and maintenance staffs will occupy about 22,000 square feet. Library, consultant, conference, and reproduction rooms will occupy 5,000 square feet. The remainder of the building will house mechanical equipment, storage, utilities, corridors, rest rooms, and similar space. The project also includes site development, access roadway, parking, utilities, and site landscaping.

PROJECT COST ESTIMATE:

This cost estimate is based on a preliminary engineering report.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>	---	---	---	<u>16,500,000</u>
Site preparation.....	LS	---	---	1,100,000
Architectural/structural.....	SF	90,500	81.77	7,400,000
Mechanical.....	SF	90,500	50.83	4,600,000
Electrical.....	SF	90,500	37.57	3,400,000
<u>Exp.</u>	---	---	---	---
<u>Fallout Shelter</u> (not feasible).....	---	---	---	---
<u>Total</u>				<u><u>16,500,000</u></u>

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan

Figure 2 - Site Plan

OTHER EQUIPMENT SUMMARY:

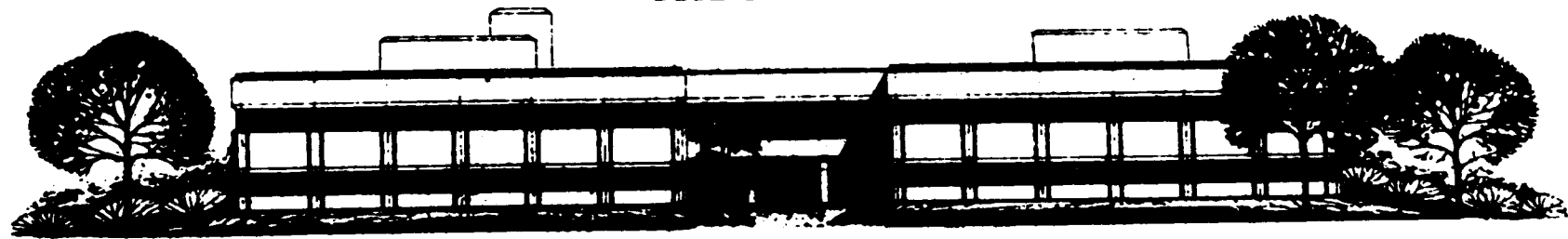
Computer and other electronic equipment is being purchased with R&D funds. Office open landscaping, furnishings, and related equipment will be provided from R&PM funds.

FUTURE CoF FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project at this time. Portions of the building, however, will be designed for possible expansion should it be required in the future.

AMES RESEARCH CENTER
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF NUMERICAL AERODYNAMIC SIMULATION FACILITY

SITE PLAN



South

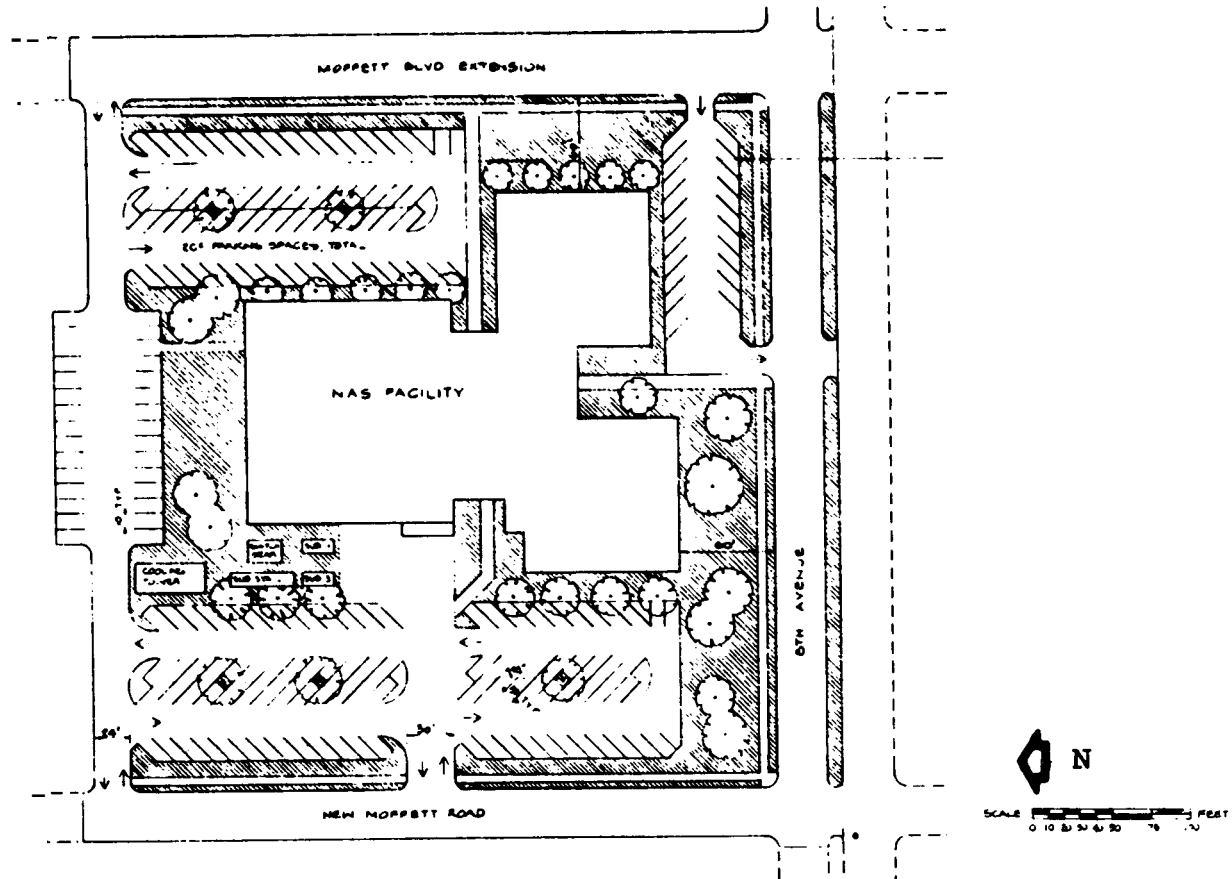


FIGURE 2

CF 6-7

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

SUMMARY

LANGLEY RESEARCH CENTER

	<u>Amount</u>	<u>Page No.</u>
<u>Office of Aeronautics and Space Technology:</u>		
Modifications to 8-Foot High Temperature Tunnel	<u>13,800,000</u>	CF 7-1

LANGLEY RESEARCH CENTER
FISCAL YEAR 1985 ESTIMATES
MODIFICATIONS TO 8-FOOT HIGH TEMPERATURE TUNNEL

LOCATION PLAN

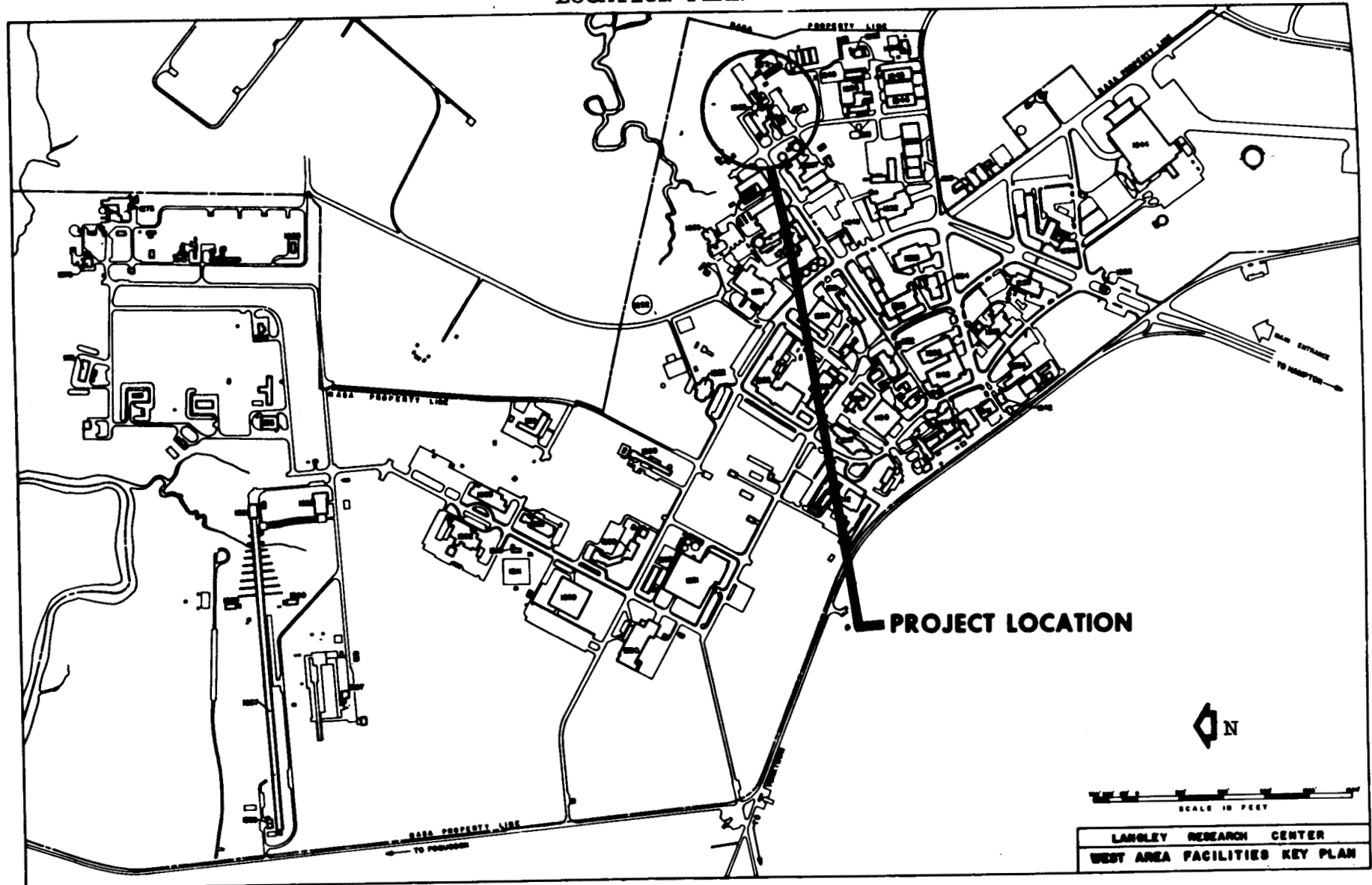


FIGURE 1

CF 7-1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	Modifications to 8-Foot High Temperature Tunnel
INSTALLATION:	Langley Research Center
	FY 1985 CoF ESTIMATE: \$13,800,000

LOCATION OF PROJECT: Hampton, Virginia

COGNIZANT HEADQUARTERS OFFICE: Office of Aeronautics and Space Technology

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF funding.....	1,190,000	1,383,000	2,573,000
Capitalized investment.....	N/A	12,683,162	12,683,162
Total.....	<u>1,190,000</u>	<u>14,066,162</u>	<u>15,256,162</u>

SUMMARY PURPOSE AND SCOPE:

This **project** will support significant advances in supersonic and hypersonic research by adding new capability to the 8-Foot High Temperature Tunnel in Building 1265 and upgrading existing support systems and equipment. These modifications will provide aerothermodynamic and structural testing capability for air-breathing propulsion systems for aircraft and missiles which operate at altitudes from 50,000 feet to 120,000 feet and Mach numbers between 4.0 and 5.0. Research capability for testing hydrogen and hydrocarbon-fueled ramjets and **scramjets** will also be provided by these facility modifications.

PROJECT JUSTIFICATION:

The Langley Research Center (LaRC) has been developing a technology base for hydrogen and hydrocarbon scramjets and has conducted limited evaluations on subscale engines. Present advances are focused on an airframe integrated concept that includes a vehicle forebody/inlet, combustor and vehicle/afterbody nozzle. However, existing small scale facilities severely limit testing capabilities. To advance this technology, full-scale tests are required to demonstrate a complete flight-weight, flight-scale engine system to determine engine performance, module interactions, nozzle thrust effects and engine scale performance. Full-scale structural test capability is also required to determine engine component interactions, cooling performance, and thermal structural performance.

Current facility capabilities for testing full-scale missile systems with propulsion at high Mach numbers are very limited. Current facilities can accommodate full-scale ramjets and missile models up to about Mach 4. Other test facilities can simulate flight Mach numbers up to Mach 7, but they are small and can only accommodate limited subscale engine development. The Langley 8-Foot High Temperature Tunnel currently has the capability for aerothermodynamic and thermal structural testing from Mach 5.8 to Mach 7.2, but has no propulsion testing capability and also leaves a gap in the Mach 4-5 range. It is the only facility in the country that can be cost-effectively modified to fill this gap to support propulsion testing and full scale missile research.

In addition to NASA, the Department of Defense (DOD) has ongoing ramjet/scramjet and missile development programs which could be tested in the modified tunnel. A complete missile tested at conditions simulating the entire altitude/Mach number envelope of flight would greatly reduce development risk, time, and cost.

IMPACT OF DELAY:

The delay of this project would have a significant impact on NASA's scramjet propulsion research effort and delay advances in DOD's missile development. Current research is limited by the nonavailability of a facility capable of providing a high mach number (4-5) and large scale testing. Specific programs that will be affected are cruise vehicles (hydrogen-fueled) and hypersonic missile technology.

PROJECT DESCRIPTION:

In order to provide increased capability, this project provides for modifications in three areas: 1) the replacement and overhaul of several high use pieces of tunnel support equipment; 2) the addition of an oxygen-enrichment system which will allow the test stream to simulate air for propulsion testing; and 3) new nozzles to provide for facility testing capability in the Mach 4 to 5 range.

The required facility modifications include rehabilitating the methane gas and gaseous hydrogen systems, replacing compressor systems, modifications to the piping system, new combustion air control valves, etc. In addition, the cooling system for the model support strut will also be modified.

An oxygen enrichment system will be provided to replenish the oxygen depleted in burning methane and air to provide the true environment required for hypersonic flow simulation. This system will inject oxygen directly into the annular space between the inner and outer liners of the combustor. Oxygen will be supplied from an isolated liquid oxygen run tank. This includes a nitrogen system for evacuating oxygen when the facility is not in operation, and additional supply lines and storage tanks.

Alternate Mach number capability will be provided to extend the operating characteristics of the tunnel. This includes providing three interchangeable nozzles for Mach 4.0, 4.5, and 5.0 testing capability including the associated control systems. In addition, a mixer (chamber) where ambient air and oxygen are mixed will be installed and the minimum section of the Mach 7 nozzle will be replaced. Other items include special cranes for removing large pieces of equipment and additional piping for the high pressure air system.

PROJECT COST ESTIMATE:

This cost estimate is based on a preliminary engineering report.

	Unit of Measure	Quantity	Unit Cost	Cost
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>	---	---	---	<u>13,800,000</u>
Facility modifications	LS	---	---	3,022,000
Methane gas system	LS	---	---	(313,000)
Gaseous hydrogen system	LS	---	---	(505,000)
Model support strut	LS	---	---	(191,000)
Combustor mods	LS	---	---	(179,000)
Miscellaneous	LS	---	---	(700,000)
Contract section	LS	---	---	(1,134,000)
Oxygen enrichment system	LS	---	---	4,251,000
Liquid oxygen supply system	LS	---	---	(2,622,000)
Liquid oxygen injection system	LS	---	---	(180,000)
Nitrogen supply	LS	---	---	(439,000)
Miscellaneous	LS	---	---	(1,010,000)
Alternate mach number	LS	---	---	6,527,000
Nozzles/controls (Mach 4, 4.5, 5, 7)	LS	---	---	(1,727,000)
Mixer/liner	LS	---	---	(986,000)
Handling equipment	LS	---	---	(1,613,000)
Miscellaneous	LS	---	---	(2,201,000)
<u>Equipment</u>	---	---	---	---
<u>Fallout Shelter (not feasible)</u>	---	---	---	---
Total				<u>13,800,000</u>

LIST OF RELATED GRAPHICS:

Figure 1 - Location Plan

Figure 2 - Aerial View

OTHER EQUIPMENT SUMMARY:

No other equipment is required to complete this project.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

LANGLEY RESEARCH CENTER
FISCAL YEAR 1985 ESTIMATES
MODIFICATIONS TO 8-FOOT HIGH TEMPERATURE TUNNEL

AERIAL VIEW



FIGURE 2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

SUMMARY

VARIOUS LOCATIONS

	<u>Amount</u>	<u>Page No.</u>
<u>Office of Space Tracking and Data Systems:</u>		
Construction of 34-Meter Antenna, Madrid, Spain, Jet Propulsion Laboratory.....	6,000,000	CF 8-1
Modifications of 64-Meter Antenna, DSS-63, Madrid, Spain, Jet Propulsion Laboratory.....	<u>7,800,000</u>	CF 8-8
Total.....	<u><u>13,800,000</u></u>	

VARIOUS LOCATIONS
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF 34-METER ANTENNA, MADRID, SPAIN

LOCATION PLAN

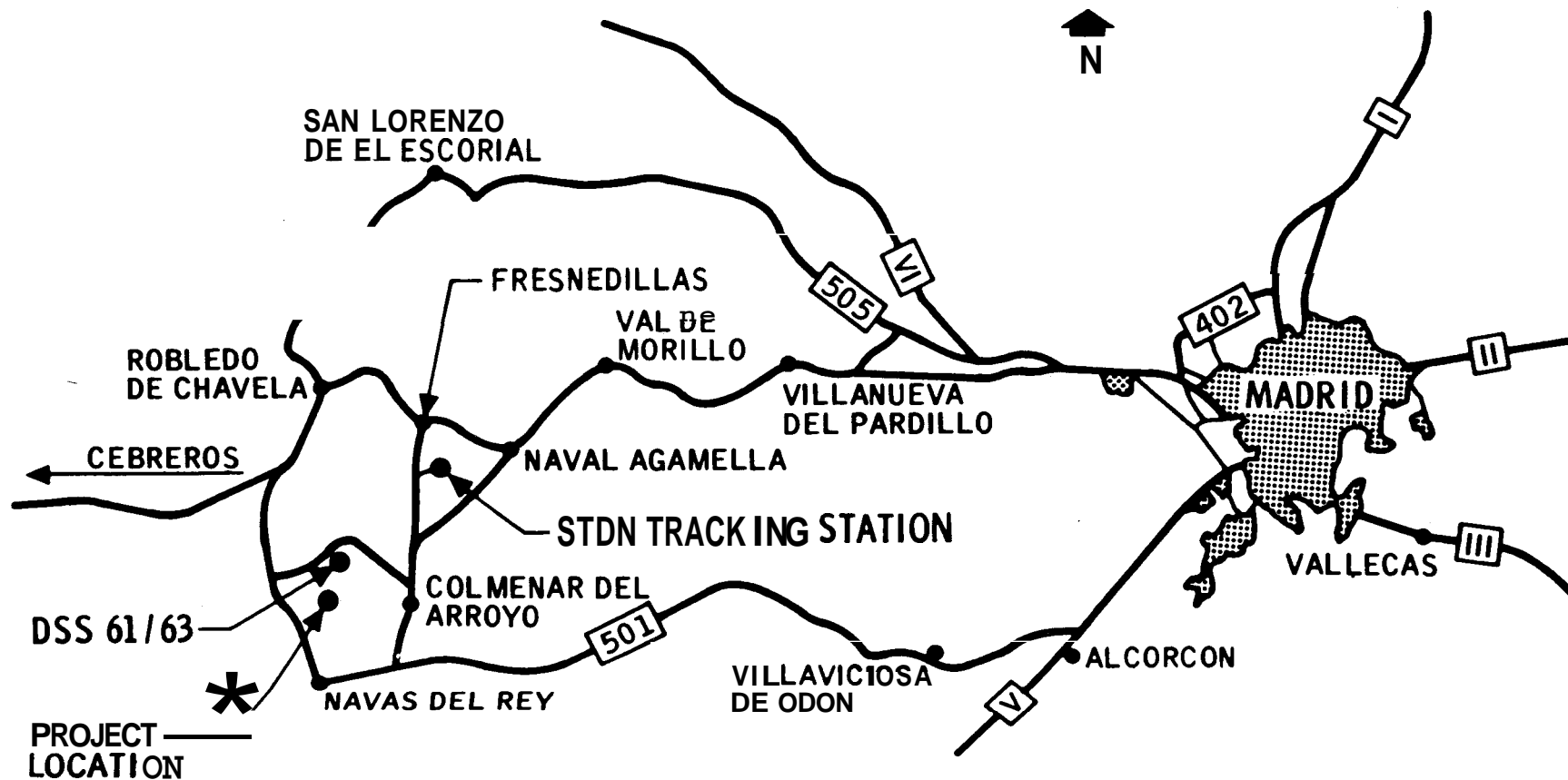


FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	<u>Construction of 34-Meter Antenna, Madrid, Spain</u>		
INSTALLATION:	<u>Jet Propulsion Laboratory</u>		
	FY 1985 CoF ESTIMATE:	<u>\$6,000,000</u>	

LOCATION OF PROJECT: Madrid, Spain

COGNIZANT HEADQUARTERS OFFICE: Office of Space Tracking and Data Systems

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF fbnding.....	100,000	---	190,000
Capitalized investment.....	<u>N/A</u>	<u>---</u>	<u>---</u>
Total.....	<u>100,000</u>	<u>---</u>	<u>100,000</u>

SUMMARY PURPOSE AND SCOPE:

This project provides for the construction of a 34-meter diameter X-band frequency antenna at the Deep Space Network (DSN) complex in Madrid, Spain (Figures 1 and 2). The antenna is necessary for meeting Voyager 2 - Neptune encounter communication requirements, supporting Galileo science experiments and navigation requirements, and reducing the communications overload at the Madrid complex to minimize science data losses. This antenna will be combined in an array with the other DSN antennae at the complex for large aperture requirements, and used separately to provide the improved capability needed for concurrent support of multiple spacecraft from Madrid.

PROJECT JUSTIFICATION:

The DSN provides tracking and two-way communications with unmanned planetary spacecraft, and supports various deep space science experiments. Spacecraft at increasingly greater distances such as Voyager require additional ground-based antenna aperture for precision tracking and the needed data return rates. Support for the Voyager 2 - Neptune encounter in 1989 will be provided by arraying the deep space antennae at each of the three world wide DSN complexes. The increase in aperture at the Madrid complex for this mission will be provided by this new 34-meter antenna, and by the modification of the 64-meter DSS-63 antenna to a 70-meter diameter which is proposed as a separate project in FY 1985. These two antennae will be arrayed with the existing 34-meter DSS-61 antenna at the complex to provide sufficient aperture for receiving Neptune images at the Madrid location. This aperture improvement is also necessary for reducing losses of non-imaging science and engineering data at antenna pointing angles near the earth's horizon. The additional ground based aperture will also benefit future spacecraft by reducing on-board communications design requirements and costs.

The capability of the Madrid complex for supporting other missions must also be improved. This new antenna must be operational by mid-1987 to support the Galileo mission. It will be used to support gravity wave experiments in late 1987 and late 1988, and for critical backup VLBI (very long baseline interferometry) navigation for the Galileo probe beginning March 1988. In addition, this antenna is needed for improving multiple mission support capability to achieve communications requirements in the later 1980's and beyond. These include not only the Voyager 1 and 2 and Galileo missions, but also such missions as the Venus Radar Mapper, Pioneer 10, Pioneer 11, Pioneer Venus Orbiter, and the International Solar Polar Mission.

The addition of a 34-meter antenna will result in a configuration of deep space antennae at the Madrid complex that is comparable to the configurations at the other E N complexes in Goldstone, California, and Canberra, Australia. This network balance will improve the overall E N support uniformity for fuller realization of the scientific potential of current and future missions.

IMPACT OF DELAY :

Delay of this project would preclude the Madrid complex from receiving Neptune images, providing necessary Galileo support, and achieving acceptable science data return in the late 1980's and beyond.

PROJECT DESCRIPTION:

This project provides for the construction of a 34-meter diameter X-band frequency antenna (Figure 3) at the Madrid complex in Spain. Site support facilities include an entrance road, security fencing, grading, paving, drainage, electrical power distribution, and fire protection. The antenna will be installed on a new foundation and furnished with the necessary control system. The antenna includes all structural, mechanical, and electrical elements; reflector surface panels; the subreflector; and a support systems enclosure.

PROJECT COST ESTIMATE:

This cost is based on preliminary engineering and related studies.

	Unit of <u>Measure</u>	<u>Quantity</u>	<u>Unit</u> <u>cost</u>	<u>cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>	---	---	---	<u>6,000,000</u>
Site support facilities.....	LS	---	---	4,550,000
Antenna foundation.....	LS	---	---	550,000
Antenna.....	LS	---	---	530,000
Control system...	LS	---	---	370,000
<u>Equipment</u>	---	---	---	---
<u>Fallout Shelter</u> (not feasible).....	---	---	---	---
Total.....				<u>6,000,000</u>

LIST OF RELATED GRAPHICS:

- Figure 1 - Location Plan
- Figure 2 - Site Plan
- Figure 3 - General Arrangement

OTHER EQUIPMENT SUMMARY:

Electronic equipment and related engineering support will be provided with \$4,800,000 of Space Flight Control and Data Communications (SFC & DC) funds.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project.

VARIOUS LOCATIONS
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF 34-METER ANTENNA, MADRID, SPAIN
SITE PLAN

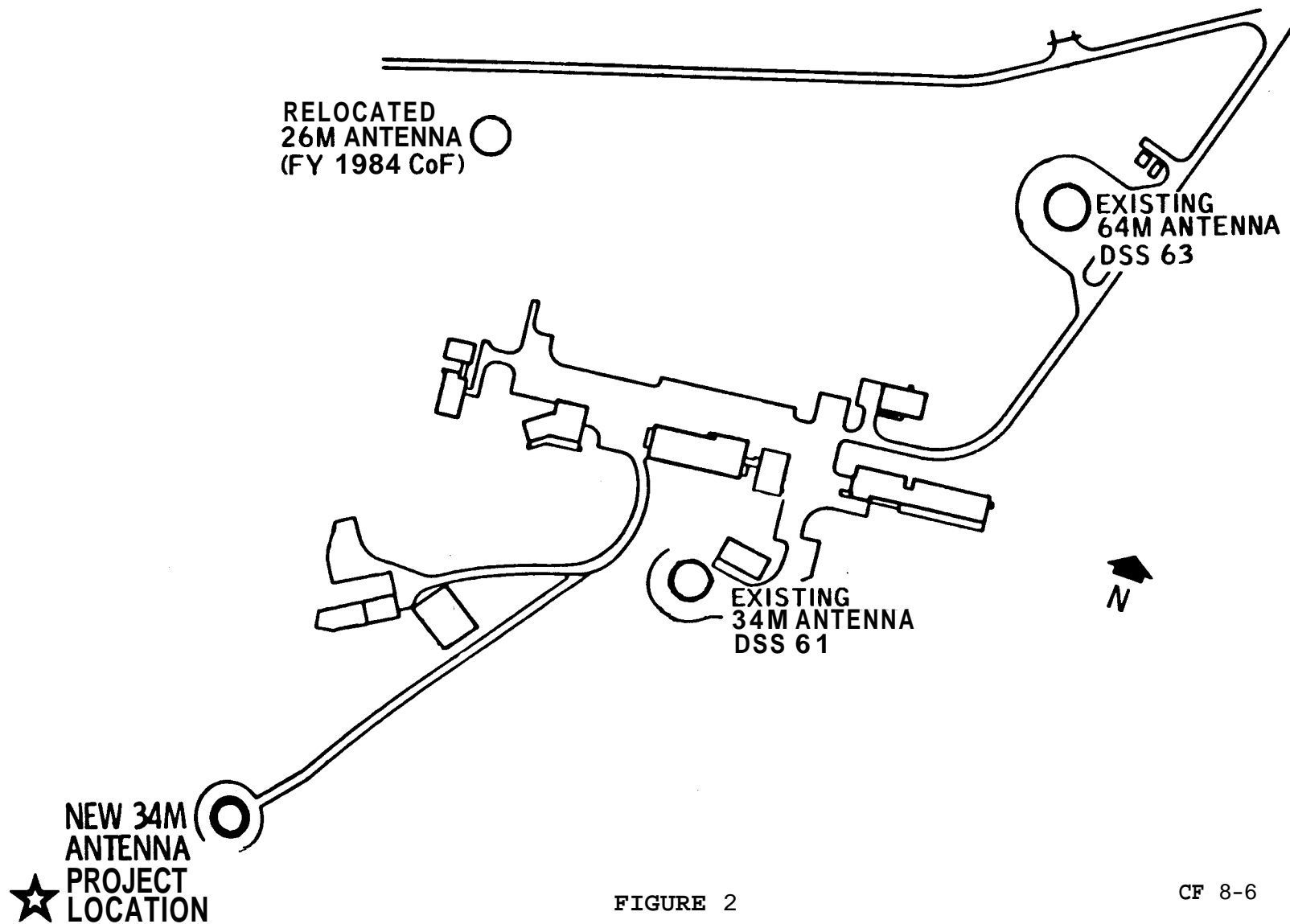


FIGURE 2

CF 8-6

VARIOUS LOCATIONS
FISCAL YEAR 1985 ESTIMATES
CONSTRUCTION OF 34-METER ANTENNA, MADRID, SPAIN

GENERAL ARRANGEMENT

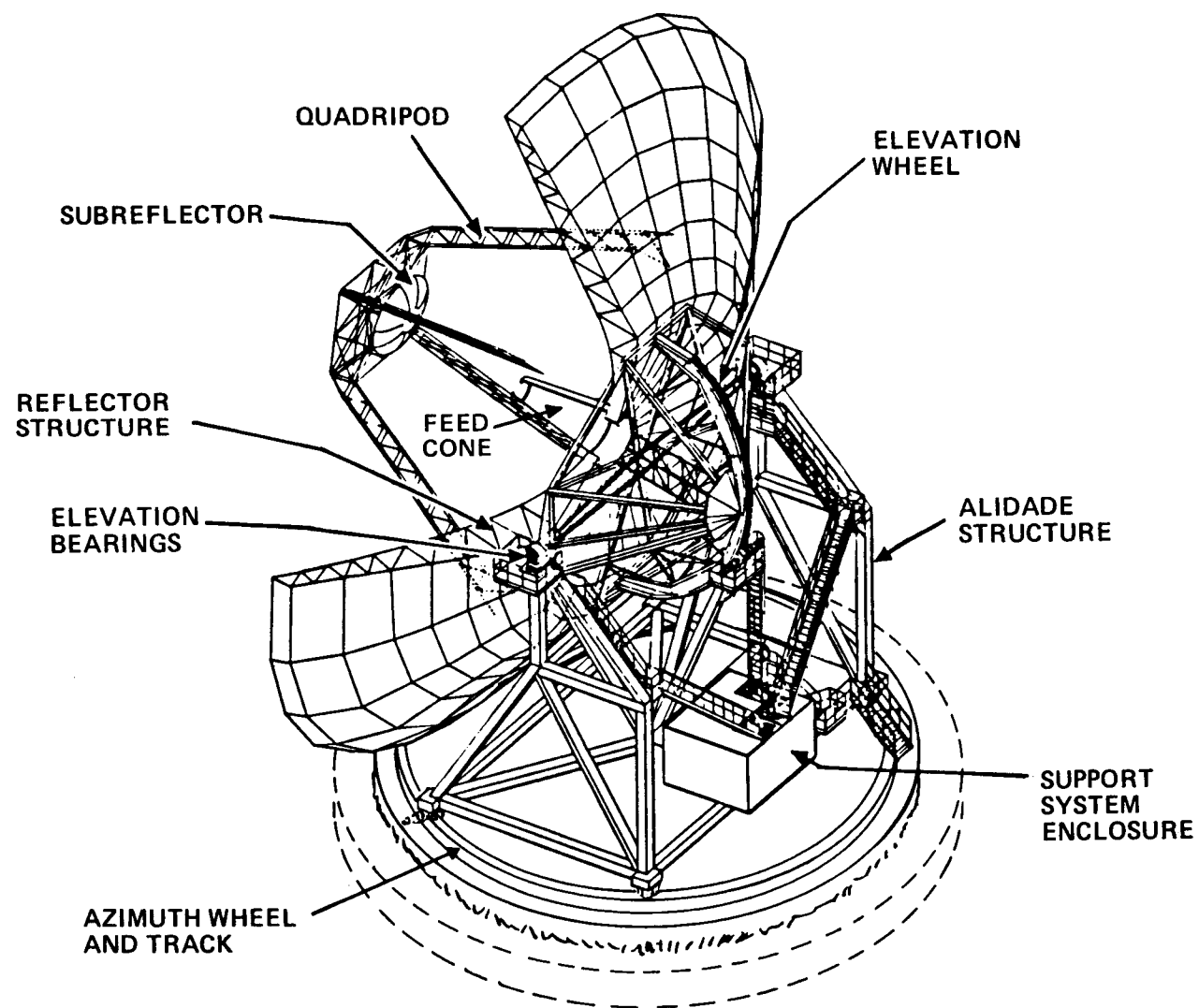


FIGURE 3

VARIOUS LOCATIONS
FISCAL YEAR 1985 ESTIMATES
MODIFICATIONS OF 64-METER ANTENNA, DSS-63, MADRID, SPAIN

LOCATION PLAN



FIGURE 1

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	<u>Modifications of 64-Meter Antenna, DSS-63, Madrid, Spain</u>
INSTALLATION:	<u>Jet Propulsion Laboratory</u>
FY 1985 CoF ESTIMATE: <u>\$7,800,000</u>	

LOCATION OF PROJECT: Madrid, Spain

COGNIZANT HEADQUARTERS OFFICE: Office of Space Tracking and Data Systems

FY 1984 AND PRIOR YEARS FUNDING: The following prior years funding is related to this project:

	<u>Planning and Design</u>	<u>Construction</u>	<u>Total</u>
Specific CoF funding.. .. .	640,000	310,000	950,000
Capitalized investment.....	<u>N/A</u>	<u>14,325,000</u>	<u>14,325,000</u>
<u>Total</u>	<u>640,000</u>	<u>14,635,000</u>	<u>15,275,000</u>

SUMMARY PURPOSE AND SCOPE:

This project provides modifications for upgrading the 64-meter DSS-63 antenna at the Deep Space Network (DSN) Complex in Madrid, Spain (Figures 1 and 2), to a 70-meter diameter, higher efficiency antenna. The upgrading improves by 45 percent the communication capability to provide required support for deep space missions. This project is necessary for support of the Galileo, Venus Radar Mapper, and Voyager 2 - Neptune missions, for continuing support to spacecraft beyond the outer planets, and for improving various deep space scientific data gathering capabilities.

PROJECT JUSTIFICATION:

The DSN provides tracking and two-way communications with unmanned planetary spacecraft, and supports various deep space science experiments. Spacecraft operating at increasingly greater distances from earth require additional effective ground-based antenna aperture for meeting communication thresholds. Upgrading this antenna to a 70-meter diameter and incorporating today's technology to improve efficiency will extend the communication threshold and coverage for the Pioneer 10, Voyager 1, and Voyager 2 spacecraft by up to five years as they depart the solar system in the 1990's. The modifications will provide needed improvements in this antenna's capability for very long baseline interferometry (VLBI), radio science, radio astronomy, emergency spacecraft command transmitting, and spacecraft data telemetry. For Galileo and the Venus Radar Mapper, the improved VLBI is necessary for navigation requirements, and the improved telemetry provides needed support coverage and reliability for science data return. Similar modifications are planned for the 64-meter antenna at Goldstone, California, and the one at Canberra, Australia.

Using the baseband arraying techniques, signals from different antennae can be combined to increase the effective aperture. One antenna must be above the communication threshold (the 70-meter in this case) before the technique can be applied. For the Voyager 2 - Neptune encounter in 1989, the aperture necessary for receiving images in Spain requires that the antenna modified by this project be arrayed at X-band frequencies with the existing 34-meter DSS-61 antenna at the Madrid complex and a new 34-meter antenna proposed as a separate project for FY 1985. This aperture improvement is also necessary for reducing losses of non-imaging science and engineering data at antenna pointing angles near the earth's horizon, and for obtaining high data rates. Upgrading this antenna to a 70-meter diameter will also enable it to independently support spacecraft that previously would have required arraying with a 34-meter antenna. As a result, the overload of support communications requirements at the complex in the late 1980's and beyond will be partially relieved. This improved ground-based support capability will also reduce on-board communications design requirements and costs for new spacecraft.

The 1960's technology 64-meter E N antennae are basically S-band frequency antennae that have been upgraded by adding higher frequency X-band electronics. Because S-band quality reflector surface panels (Figure 3) are inefficient at X-band, better quality panels will improve performance. Current technology permits the fabrication of improved surface panels, better structural designs, and reflector surface shaping for higher efficiency radio frequency performance. Improved subreflector technology, including better drive and control systems to compensate for antenna reflector gravity distortions, has also been developed. This project, and future projects for the other two E N 64-meter antennae, will incorporate this new technology to obtain a 45 percent improvement in effective aperture from only a 20 percent increase in reflector aperture area.

This antenna in Spain must be modified in FY 1985 so it may be returned to operation in time for support in 1987. This is also necessary for enabling the future sequential modification of the 64-meter antennae at Goldstone and Australia in time to support the Voyager 2 - Neptune encounter without requiring more than one antenna at a time from spacecraft support.

IMPACT OF DELAY :

Delay of this project would preclude availability of a 70-meter antenna in Spain for the Galileo mission, and seriously impact the upgrading of the two other 64-meter DSN antennae in time for supporting the Voyager 2 - Neptune encounter.

PROJECT DESCRIPTION:

The modifications (Figure 3) will incorporate state-of-the-art technology for antenna component design, fabrication, and alignment. High efficiency X-band panels will be installed over the full reflector surface. The reflector backup structure will be enlarged to a 70-meter diameter and modified for increased strength and stiffness. A new quadripod and high precision subreflector compatible with the 70-meter reflector will be installed. The elevation wheel will be reinforced for strength and stiffness and increased in weight to balance the modified reflector-subreflector assembly. A new drive and control system for the new subreflector is also included.

PROJECT COST ESTIMATE:

This cost is based on preliminary engineering and related studies.

	<u>Unit of Measure</u>	<u>Quantity</u>	<u>Unit cost</u>	<u>cost</u>
<u>Land Acquisition</u>	---	---	---	---
<u>Construction</u>;.....	---	---	---	7,800,000
Reflector panels.	LS	---	---	3,700,000
Quadripod.	LS	---	---	700,000
Subreflector.....	LS	---	---	800,000
Reflector structure and elevation wheel modifications..	LS	---	---	2,250,000
Subreflector drive and control system	LS	---	---	350,000
<u>Equipment</u>	---	---	---	---
<u>Fallout Shelter</u> (not feasible).....	---	---	---	---
Total.....,.....,.....				7,800,000

LIST OF RELATED GRAPHICS

- Figure 1 - Location Plan
- Figure 2 - Site Plan
- Figure 3 - General Arrangement

OTHER EQUIPMENT SUMMARY :

No other equipment is required to complete this project.

FUTURE CoF ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

No future CoF funding is required to complete this project; however, similar upgrading of the 64-meter antenna at each of the other two DSN complexes (Goldstone and Australia) is planned for the future.

VARIOUS LOCATIONS
FISCAL YEAR 1985 ESTIMATES
MODIFICATIONS OF 64-METER ANTENNA, DSS 63, MADRID, SPAIN

SITE PLAN

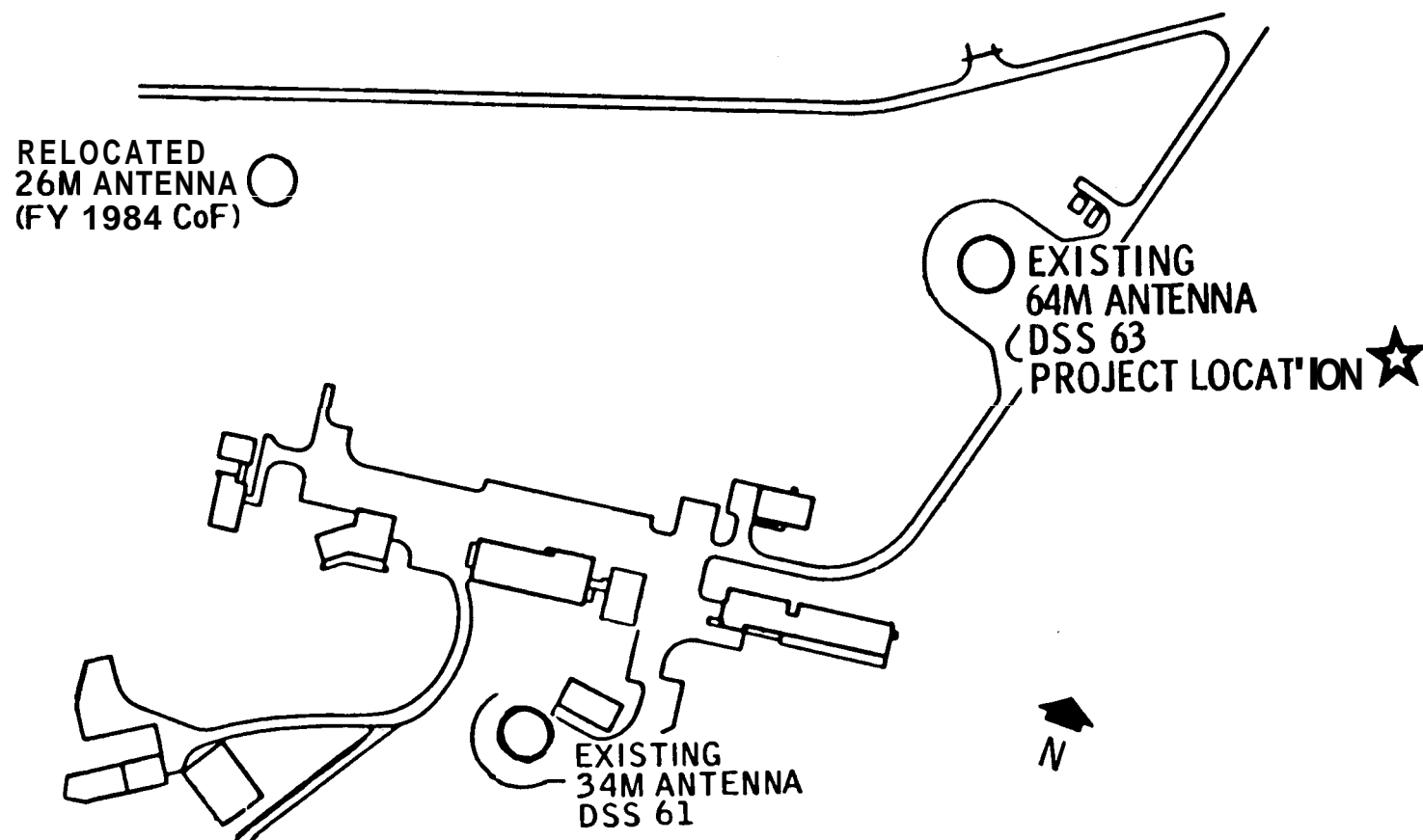


FIGURE 2

VARIOUS LOCATIONS
FISCAL YEAR 1985 ESTIMATES
MODIFICATIONS OF 64-METER ANTENNA, DSS-63, MADRID, SPAIN

GENERAL ARRANGEMENT

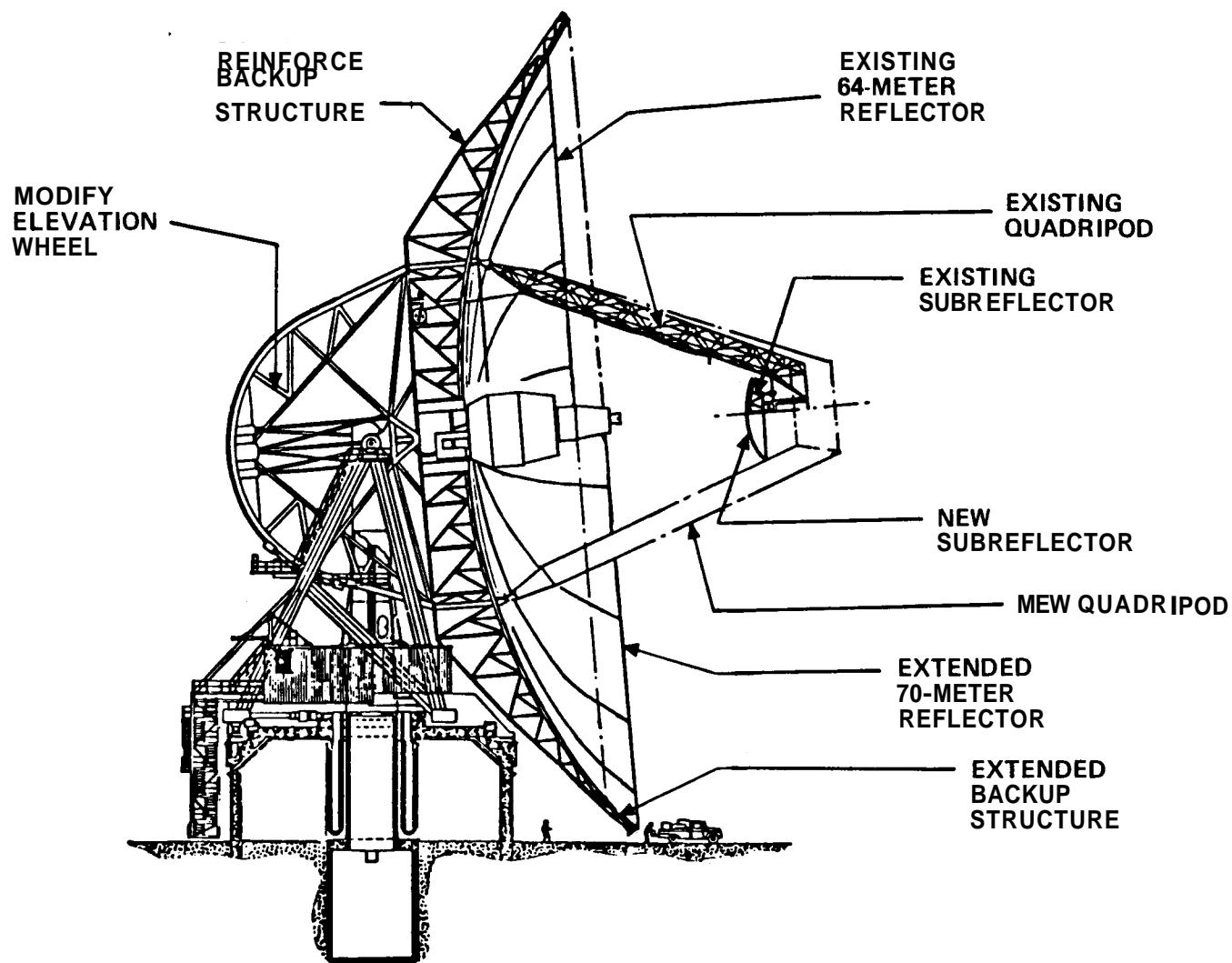


FIGURE 3

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

SUMMARY

REPAIR

	<u>Amount</u>	<u>Page No.</u>
<u>Summary of Project Amounts by Location:</u>		
Ames Research Center	1,395,000	CF 9-3
Dryden Flight Research Facility....	195,000	CF 9-5
Goddard Space Flight Center	1,180,000	CF 9-5
Jet Propulsion Laboratory.....	1,900,000	CF 9-6
Johnson Space Center	1,225,000	CF 9-7
Kennedy Space Center	1,455,000	CF 9-8
Langley Research Center	2,625,000	CF 9-10
Lewis Research Center	2,440,000	CF 9-11
Marshall Space Flight Center	955,000	CF 9-14
Michoud Assembly Facility.	1,665,000	CF 9-14
National Space Technology Laboratories.....	2,425,000	CF 9-15
Wallops Flight Facility..	1,555,000	CF 9-17
Various Locations.....	690,000	CF 9-19
Miscellaneous Projects Not Exceeding \$150,000 Each..	<u>295,000</u>	CF 9-19
Total.....	<u>20,000,000</u>	

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National Aeronautics and Space Administration
Washington, D.C. 20548

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	<u>Repair of Facilities at Various Locations, Not In Excess Of \$750,000 Per Project</u>		
INSTALLATION:	<u>Various Locations</u>		
	FY 1985 CoF ESTIMATE:		<u>\$20,000,000</u>
	FY 1983:	\$14,000,000	FY 1984: \$17,500,000

COGNIZANT INSTALLATIONS/LOCATION OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE:

These resources will provide for large repairs to facilities at NASA field installations and Government-owned industrial plants supporting NASA activities. Included in the request are those facility repair needs for FY 1985 that can be foreseen at the time of the submission of these estimates, and that are estimated not to exceed \$750,000 per project. The thrust of this program is to provide a means to restore facilities or components thereof, including collateral equipment, to a condition substantially equivalent to their originally intended and designed capability. The request includes the substantially equivalent replacement of utility systems and collateral equipment necessitated by incipient or actual breakdown. This work also includes major preventive measures which are normally accomplished on a cyclic schedule of greater than one year.

PROJECT JUSTIFICATION:

A major portion of the Agency's buildings exceed 15 years in age, and increases in repair requirements are to be expected. Maintenance and repair costs for mechanical and electrical systems in a typical building are almost three times higher during the 16- to 30-year period of a building's life than they are during the initial

15 years of beneficial occupancy. At about the 15-year point, many electrical and mechanical components reach the end of their serviceable or economic life and should be replaced in the interest of long-term economy. Continued piecemeal repair of these components usually requires more resources in the long run than replacement after the end of the economic life of the original components. Some 75 percent of the physical plant is in the 16- to 30-year old category.

The major thrust of this repair program, as well as the rehabilitation and modification program, is to preserve the Agency's \$3.3 billion (as of September 30, 1983) physical plant. The major distinction between these classes of work is whether or not the intended work is to bring the facility and its components to a condition substantially equivalent to its designed capacity, efficiency, and capabilities. If such is the case, the work is classified as repair. An analysis of each of the projects for which funds are requested indicates that this work must be addressed and progressively accomplished. Otherwise, risks are increased and future costs of the specific work will be greater. More importantly, there will be increased breakdowns that require costly emergency repairs.

This program includes only facility repair work having an estimated cost not in excess of \$750,000 per project. The work is of such a nature and magnitude that it cannot be accomplished by routine day-to-day facility maintenance and repair activities, or by related routine facility work efforts that are provided for in other than CoF estimates.

PROJECT DESCRIPTION:

Proposed repair projects for FY 1985 totaling \$20,000,000 are described under "PROJECT COST ESTIMATE." Projects estimated to cost not in excess of \$150,000 have not been individually described or identified by Center, and the total estimate for these projects is \$295,000. This repair program has been distilled from requests for FY 1985 exceeding \$28,600,000, and thus represents a modest request in relation to the continuing backlog of this type of work. Based on relative urgency and expected return on investment, the projects which comprise this request are of the highest priority. Deferral of this mission-essential work would adversely impact the availability of critical facilities and program schedules.

During the course of the year, it is recognized that some rearrangement of **Priority** may be necessary. This may force a change in some of the items to be accomplished. Any such change, however, will be accomplished within available resources. The following broad categories of work are described further in the "PROJECT COST ESTIMATE" :

a. Utility Systems	10,035,000
b. General Purpose Buildings	380,000
c. Technical Buildings/Structures	5,405,000
d. Pavements and Drainage	1,540,000
e. Building Exteriors and Roofs	2,640,000

PROJECT COST ESTIMATE :

A. <u>Ames Research Center</u> (ARC).....	<u>1,395,000</u>
1. Repair of Unitary Plan Wind Tunnel Main Drive Motors (N-227)	390,000

The Unitary Plan Wind Tunnel (UPWT), built 28 years ago, consists of the 11 x 11-foot transonic, 9 x 7-foot supersonic, and 8 x 7-foot supersonic test legs. It is powered by four 45,000 horsepower wound rotor induction motors. Recent inspection revealed a requirement for repairs to the motors. Two require major overhaul, including shifting and rewedging the stators, reshimming the rotors, cleaning, repairing or replacing bearings and other parts, reinsulating bearing pedestals, and painting. Three motors require reinsulation of slip rings. All thrust bearings and motor alignment will be checked and corrected as necessary. The liquid rheostat tanks which are part of the motor control system will be stripped and reinsulated or replaced as required. This wind tunnel system receives high usage and plays a critical role in a wide variety of aerodynamic research and development investigations. Failure to overhaul and repair the four wind tunnel drive motors will eventually result in a breakdown which would interrupt scheduled research and require extensive, costly emergency repairs.

2. Repair of 6 x 6-Foot Wind Tunnel Drive Motors (N-226)	280,000
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The 6 x 6-foot wind tunnel supports many aerodynamic tests, and has been used almost daily since it was completed in 1945. The tunnel's two 25,000 horsepower drive motors require overhaul and repair. The

required work includes rewinding and reinsulation of the motors; realigning and wedging the stators and rotors; inspecting, repairing, and reinsulating the bearings, thrust blocks, and pedestals; and cleaning and painting. Because of the age of the motors, which have never been overhauled, wedges and pieces of winding packing have become loose. As a result, frequent inspection is required to ensure no foreign material is in the motors that may cause arcing between the windings and ground. Failure to repair these motors will eventually result in major damage and cause tunnel shutdown for expensive unscheduled repairs and consequent disruption to research schedules.

3. Repair of Roofs, Various Buildings 200,000

The Administration Building (N-200), Flight Support Building (N-211), and Administrative Management Building (N-241), all have roofs that have deteriorated, leak badly, and must be replaced. The repairs involve stripping approximately 48,000 square feet of mineral surface roof, addition of several expansion joints and roof drains, some alteration to roof slopes, application of two inches of rigid foam thermal insulation, and application of standard mineral felt and tar surface courses. Simple spot repairs are no longer effective for these deteriorated roofs. Deferral of repairs will allow continued leaks in these three buildings, with additional and expensive stopgap spot repairs and, eventually, more expensive building rehabilitation.

4. Repair of Compressor Drive Motors (N-229 and N-250) 290,000

This project will repair and overhaul two compressor motors which provide over half the compressed air used in Ames wind tunnels and other research facilities. Neither motor has been overhauled within the past ten years. One motor is a 5,500 horsepower synchronous motor. Overhaul will consist of cleaning, realignment, checking and repairing insulation as necessary, checking and repairing bearings, and painting. The second motor, a 4,000 horsepower synchronous motor will be rewound and converted to 4.16 kV in addition to other repairs similar to those for the 5,500 horsepower motor. A 13.8 kV - 4.16 kV delta Y transformer will be installed. Overhaul and repair of these motors is required to ensure continued reliable high pressure air service to important research facilities.

5. Repair of Heating, Ventilating, and Air-conditioning, Various Buildings.. 235,000

This project will provide major repairs to components of five heating and cooling systems at Ames. The boiler stack in hilding N-243 was installed in 1966 and is now corroded beyond repair and will be replaced. The boiler in Wlilding N-229 was installed in 1960 and has been repaired several times. Fire box leaks and corrosion dictate replacement of the boiler as it is no longer practical to repair. The 270-ton air-conditioning cooling tower fill at hilding N-244, installed in 1967, is corroded and rotted and requires major structural repair and fill replacement, and the motor and fan mounting require overhaul and repair. The 566-ton cooling

tower at Building N-239 is in a state of deterioration. It requires complete structural rebuild and replacement of the fill. The two 383-ton reciprocating chillers at Building N-239 were installed in 1965 and have been operated continuously since then. Both require complete overhaul. Completion of these repairs in a timely manner will significantly reduce the expensive and inefficient maintenance now required on these deteriorated heating and cooling system components.

B. <u>Dryden Flight Research Facility</u> (DEF).....	195,000
1. Repair of Roofs, Various Buildings.....	195,000

The roofs to be repaired are over 30 years old, and have deteriorated in the harsh desert environment. The 57,000-square foot roof of Building 4802 will be removed and replaced with one inch of sprayed urethane foam coated with 25 to 30 mils of acrylic elastomeric film. The roofs of three buildings (4806, 4807A, and 4808), approximately 31,000 square feet, are of formed metal roofing and will also be urethane foam coated with acrylic film. The roofs now require expensive spot repair of numerous leaks.

C. <u>Goddard Space Flight Center</u> (GSFC).....	1,180,000
1. Replace Steam Lines from Building 24 to Buildings 1 and 2	490,000

This project provides for the replacement of the 20-year-old steam supply and condensate return lines. The new pipe will be pre-insulated direct burial and consists of 650 linear feet of 8 inch and 4 inch condensate, and 450 feet of 5-inch and 600 feet of 4-inch steam lines interconnecting the Central Heating and Refrigeration Plant (24), manholes 14, 6-1, 6, the Space Projects Building (1) and the Research Projects Laboratory (2). New replacement manholes will be installed to allow for parallel piping construction and to prevent excessive downtime.

Currently, numerous leaks have developed in the piping system and the steel housing conduit due to severe corrosion. Aerial thermographs have revealed excessive heat losses from this pipe line. The proposed work will also include cathodic protection.

2. Repair Roof, Building 3.....	300,000
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This project provides for the balance of the roof replacement (30,000 square feet) of the Central Flight Control and Range Operations Building (3). Coping, flashing, gravel stop, pedestrian walkways, expansion joints, and other accessories will also be replaced. The existing roof is more than 20 years old and contains numerous patches and temporary repairs. The heavy traffic associated with the installation of equipment and

maintenance work on the roof has resulted in frequent leaks and deterioration. An initial 23,000 square feet was replaced as an emergency repair because of severe deterioration.

3. Repair Air Handling Units (6, 11, and 12) 390,000

This project provides for the repair of five Air Handling Units (AHU's) in the Space Sciences Laboratory (6), 4 AHU's in the Applied Sciences Laboratory (11), and 3 AHU's in the Tracking and Telemetry Laboratory (12). The repair work will include the replacement of heating and cooling coils, leaking dampers, piping and insulation, and pneumatic controls. Also included is the repair of deteriorated equipment and components within the mechanical equipment rooms. The existing package/built-up AHU's have been in operation since the early 1960's. Due to deterioration and corrosion resulting from their vintage and extensive operations, replacement of equipment components and/or entire units has become necessary. This repair project will improve operating efficiency and enhance system reliability.

D. Jet Propulsion Laboratory (JPL)..... 1,900,000

1. Repair Water Lines..... 480,000

This project provides for the replacement of approximately 2,700 linear feet of deteriorated underground water lines and upgrading existing water service to various facilities. Work includes the installation of 4-, 6-, 8-, and 12-inch steel lines to replace existing waterlines that have been in service for about 40 years, are deteriorating rapidly, and have been repaired numerous times. The water service will be improved by providing a dual feed for fire protection for 22 JPL buildings and eliminating dead end lines and their attendant health hazards.

2. Repair Electrical Power System, SFOF..... 475,000

This project provides for the initial increment of a planned program to replace the uninterruptable power system (UPS) in the Space Flight Operations Facility (SFOF), Building 230. Work includes replacing portions of the electrical power system including the switchgear and bus ducts serving transformer T-1. A cross tie to transformer T-2 is also included. This work will provide a second source of power to both the existing and planned UPS permitting the installation of portions of the new system prior to the removal of the old. The SFOF is the center at JPL for all spacecraft tracking, control, analysis and operations, functioning 24 hours a day. The computers and data processing equipment are provided backup electrical power by the UPS. Sudden failure in the UPS could result in an emergency shutdown of the computers. The UPS is twenty years old, near the end of its useful life and must be replaced to insure reliable electrical power to the computers in the SFOF.

3. Repair of Primary Electrical System 475,000

This project provides for the repair of the primary electrical power supply to ten buildings. Work includes the replacement of Transformer Banks 30, 42 and 64 with 16.5 kV dual feed transformers and related electrical equipment. The buildings are currently served by a 2.4 kV electrical power system which is over 20 years old, deteriorated, and subject to long duration single point failure. Replacement of these elements of the electrical system is urgently needed to provide a reliable electrical power system for these ten buildings.

4. Repair Roadways. 470,000

This project provides for the replacement of approximately 7,500 square yards of deteriorated roadways in the area of Buildings 168, 183, 179, and 233, and the area of Buildings 114, 156, 161, and 198. Work includes removal of the deteriorated paving, grading for proper drainage, and the laying of a new base course and installation of three inches of asphaltic paving. Also included is the replacement of concrete curbs and guard rails on the Mesa, west of Building 212 and south of Building 260. The existing paving has deteriorated to a condition where it can no longer be corrected by maintenance. Alligatoring and large cracks have permitted water to penetrate and damage the base, thereby inducing settlement of the paving.

E. Johnson Space Center (JSC) .. 1,225,000

1. Repair of Utility Generation and Distribution Systems (24) 250,000

This project is required to maintain the reliability, efficiency, and safety of the basic utilities that are generated and distributed from the Central Heating and Cooling Plant, Building 24. This is part of a multiyear repair program to preclude serious outages by scheduling work in relation to the service life expectancy of the various components. These resources will provide for the repair/replacement of 15 valves, 1 boiler, 1 pump, 2 chillers, 1 heat exchanger, 2 tower fans, sump pumps, various controls, expansion joints, and insulation.

2. Repair of Heating, Ventilating, and Air-conditioning Systems, Various Buildings.. 475,000

This project is part of a multiyear program to repair heating and cooling equipment in various buildings at JSC. The work in this phase includes the repair or replacement of air handler casings and structures, compressors, condensers, controls, valves, pumps, condensate units, and fan/scroll assemblies. In addition, tasks of coil cleaning, damper and duct repair, suspension replacement, piping replacement or repair, hot water converter and generator repair or replacement, instrumentation calibration or replacement, insulating, and

painting of all components and ancillary equipment will be performed. The area of concentration will include buildings 3, 11, 16, 37, 44, 45, the Security-Control Area, and the Technical Support Facilities Area. The various heating and cooling system components are approaching the end of a useful life expectancy. Many of these components are used to regulate flow, allow maintenance shutdowns, and serve as automatic shutdown devices in case of emergency.

3. Repair of Various Facilities, White Sands Test Facility 200,000

This project provides for repair of various facilities at the JSC-White Sands Test Facility. The existing heating, ventilation, and air-conditioning (HVAC) systems have been in use since early 1964. Maintenance costs are increasing because of the deteriorating condition of this equipment. The site water tank has been in service since 1964 and requires repainting of both the interior and exterior. The batteries for the backup power system which were installed between 1966 and 1969, have since deteriorated and need to be replaced. Repairs will also be made to the HVAC equipment by replacing deteriorated components in Buildings 111, 112, 120, 121, 411, and 412. The site water system will be refurbished by replacing waterlines in Buildings 411 and 412 and rehabilitating the site water storage tank. The backup electrical power for propulsion test area controls will be refurbished by replacing the batteries for the 28-volt, DC power system.

4. Repair of Sanitary Sewer System 300,000

This project is a part of a multiyear program to repair the JSC sanitary sewer system. Substantial pipe settlement in the sanitary sewer gravity lines has been experienced at JSC. An investigation and survey using television inspection techniques indicated that approximately 26 percent of all lines required sliplining or repair to prevent recurrent blockages. The swelling and shrinkage characteristics of the soil foundation are the primary cause of failures. Also, land subsidence has contributed to some of the pipe deterioration. The work in this project includes repairs to and/or sliplining of approximately 4,238 linear feet of underground gravity lines that comprise the Center sanitary sewer system. This includes approximately 3,658 linear feet of 8-inch lines and 580 linear feet of 10-inch lines. Pipe segments which are broken will be replaced on a stabilized base material for improved support.

F. Kennedy Space Center (KSC)..... 1,455,000

1. Replace New Boiler in Utility Annex..... 430,000

This project provides for the replacement of Boiler #1 in the Utility Annex (K6-947). The deterioration of this boiler has seriously reduced its reliability and capability to meet the reheat and heating requirements of the Orbiter Processing Facility (OPF), Vertical Assembly Building (VAB), and Launch Control Center (LCC)

and could impact the Shuttle Program. Boilers #2 and #3 in the same facility have been upgraded and are in good condition. Boiler #1 will be replaced by a new 20 million Btu/hour 500 psi hot water boiler. By replacing boiler #1 now, the system reliability will be greatly improved, because one 20 million Btu unit could always be on standby to meet the added demand during Shuttle activities and during other times of the year to satisfy the total heating demand.

2. Replace Two Vertical Processing Facility (M7-1469) Air Conditioning Chillers..... 240,000

This project will replace two 150-ton air-conditioning chillers at the Vertical Processing Facility (VPF). The 23-year-old chillers are original equipment, antiquated and require constant maintenance. Service life has long been exceeded and breakdown frequency is increasing. The increase in critical Shuttle payload requirements places additional demands on the equipment, necessitating reliable and servicable equipment.

3. Repair Kennedy Parkway from Wilson Intersection to NASA Parkway 530,000

This project consists of restoring some 105,000 square yards of asphalt pavement on the Kennedy Parkway from its Wilson intersection to the NASA Parkway to preclude further deterioration of the road base. This road, which is the main artery between the KSC Industrial area and Titusville entrance through LC-39, is subjected to heavy usage by employees, tow buses, operational traffic, large trucks and the extremely heavy loads of cranes and other equipment. The current usage of this road will increase as Shuttle operations increase. The roadway is settling, longitudinal cracks have formed and are expanding, permitting moisture to enter and deteriorate the roadbed, and "washboarding" is increasing. This project is required to prevent further deterioration of the roadbase and bituminous surface, and to prevent the development of possible safety hazards as deterioration continues.

4. Repair Roofs, Hangar M & Pressure Roof Test Cell 195,000

This project will replace the roofs on Hangar M and the Pressure Proof Test Cell at CCAFS. The roofs on these facilities have deteriorated and are leaking beyond the capability of routine maintenance. The interior of Hangar M and the Pressure Proof Test Cell are also in need of refurbishment beyond that of routine maintenance. About 20,000 square feet of new 4-ply built-up gravel roofs will be installed with new flashings and drains/gravel stops, as required. The interior of Hangar M and the Pressure Proof Test Cell will be refurbished by restoring walls, replacing floor tile, and repairing ceilings.

G. Langley Research Center (LaRC)..... 2,625,000

1. Repair to High Pressure Air Distribution Piping, Various Facilities 450,000

This project provides for the repair of high pressure air systems in the East and West areas between Building 1221 and 1218A; the East Area air distribution piping; the 600 psi piping outside of Building 1221; and the 5,000 psi piping in the utility tunnel. his piping has been inspected and analyzed as part of LaRC's pressure vessel recertification program. This project specifically provides for repairing defective welds and pipes that do not meet the accepted codes and other pertinent safety criteria.

2. Repair Cooling Tower (1236)..... 495,000

This project provides for the replacement of an existing two-cell redwood cooling tower which serves Building 1236. he new tower will have the capacity to cool 7,000 GPM of uater from 119°F to 85°F with an entering air temperature of 78°F wet bulb. The existing redwood cooling tower and wooden fill have deteriorated and the gear boxes are worn and require replacement. The tower was constructed in 1950 and has been in virtually continuous use since that time. Testing performed under the Cooling Tower Institute, ATP-195, cooling tower test procedures indicate that the existing tower is performing at one-third of its original capacity.

3. Repair 2.3 kV "N1" Switchgear, Taylor Road Substation..... 495,000

This project provides for the replacement of the 2.3kV substation located on Taylor Road. The work requires disconnecting cables from existing loads, removal of existing switchgear, installation of new switchgear and transformer and, reconnecting the cables. Switchgear (N1) supplies power to Building 1213, 1218A, 1219, 1220, and 1194. It contains circuit breakers which are no longer manufactured. Spare parts are very limited and a failure in the switchgear would result in a considerable loss of service, thus impacting research in key research facilities.

4. Repair Roofs, Various Facilities, West Area..... 455,000

This project uill repair 45,400 square feet of the built-up roofs on Buildings 1232A, 1255, and 1219. The repairs uill include insulation, flashing, and other items necessary to restore the roof to its original condition. hese roofs have deteriorated and numerous leaks have been reported. A survey has shown a high moisture content in large areas of the roofs indicating that uater is now trapped between the layers of built-up roof. On warm summer days the roofs blister as the trapped uater expands causing further damage.

5. Repair "A" Switchgear (1225) and "B" Switchgear (1220 and 1232) 470,000

This project provides for the replacement of switchgear "A" in Building 1225 and "B" switchgear in Buildings 1220 and 1232. The work requires disconnecting cables, removing existing switchgear, installing new switchgear and reconnecting the cables. Switchgear "A" supplies power to the machine shop and switchgear "B" supplies power to the Avionics Integration Research Laboratory (1220), Simulation Research Facility (1220), Transport Simulator (1220), the Visual Display System (1220) and the Space Technology Laboratory (1232). Because spare parts are in limited supply and the circuit breakers are no longer manufactured, a failure would result in a lengthy loss of service, thus impacting research in a key aeronautical test facility.

6. Repair Equipment Foundations, Various Facilities.. 260,000

This project will repair the foundations for facility equipment and substations in buildings 640, 641, 1208, 1233, 1247E, 1251, 1265A, and 1265D. The existing piers, pads and footings that show excessive spalling, cracks and a high degree of deterioration will be repaired or replaced with cast-in-place concrete. The foundations which support equipment such as substations, compressors, fan motors and piping are in a deteriorated condition, some having been in place since 1944. A systematic repair program for restoring the foundations is required to insure future reliable equipment and research systems operations.

H. Lewis Research Center (LeRC)..... 2,440,000

1. Repair Steam Condensate Systems in Buildings 125, 64, and 49 490,000

This project consists of replacement of approximately 9,500 linear feet of steam condensate piping in the Engine Test Building No. 125, Central Air Equipment Building No. 64, and Materials and Structures Laboratory No. 49. This project also includes replacement of all traps, strainers, and valves at each heater location; insulation of exposed pipe and replacement of condensate return pumps.

The condensate pipe, valves and pumps are the original building equipment which is approximately 25 years of age. Components such as traps and strainers have been maintained as required, but the systems now need complete replacement due to corrosion, plugging and wear. Repair by system replacement is a cost effective way to reduce maintenance costs and reduce energy losses.

2. Repair of Domestic Water System 400,000

This project consists of repairing the existing domestic water distribution system to maintain adequate water flow and pressure at various locations throughout the Center. The work consists of replacing three (3)

water meters, and improving the metering capability; and providing restored capacity to the 12 inch and 18 inch diameter underground pipe line.

The domestic water system at LeRC has been in operation for over 40 years. The majority of the system consists of unlined cast iron piping. Over the years the deposits from the corrosive action of the water on the pipe, slime and sediments have resulted in increased friction losses in the mains, resulting in reduced flows and pressures in the system. The underground location of the piping makes maintenance difficult and costly. The repair of the domestic water system to be accomplished by this project will assure adequate water flow and pressure throughout the Center.

3. Repair of Combustion Air System in Engine Research Building (5)..... 260,009

This project consists of the repair and replacement of deteriorated 125 psig combustion air systems including 300 linear feet of 12 inch and 18 inch diameter piping, piping supports, relief devices, eroded moisture separators, mufflers, and other piping components that have been in service for 35 years.

Normal wear and corrosion of piping components in process systems have created conditions which require repairs to assure structural adequacy and continued safe operating conditions. The process systems are necessary to supply process fluids which are critical to the successful accomplishment of engine research tasks throughout the laboratory. This repair work is also necessary for the recertification of the pressurized systems.

4. Repair Cathodic Protection Systems. 295,000

This project will provide for the repair of the cathodic protection system for the LeRC natural gas, cooling tower water, potable water, service air, and combustion air piping systems. The repair will consist of all work necessary to: 1) repair, replace, and install test boxes; 2) provide for the installation of anodes where required; and 3) to provide all necessary excavation, backfilling, and sodding. Also included is documentation of all test box readings for the repaired cathodic protection system.

The cathodic protection consists of magnesium anodes which are buried below ground level and bonded to the natural gas, cooling tower water, potable water, service air, and combustion air piping. The test boxes are used to obtain pipe-to-soil potential and current readings. The readings are directly related to the remaining life of existing anodes and to the degree of protection being afforded the piping system. From recent surveys of the test boxes, it has been determined that of the 160 original test boxes, 66 have either been destroyed or are not locatable due to past construction of buildings, roadwork, and/or underground utility repair work or installation. Of the remaining 94 test boxes, 26 are in need of repair. Also, there are

approximately 40 areas from which test box readings indicate pipe-to-soil potential readings less than that required for an adequately protected piping system.

5. Repair of Walcott Road Between Taylor Road and Brookpark Road 260,000

This project provides 1,550 feet of road repair and resurfacing of Walcott Road from Brookpark Road to Taylor Road. The work includes the removal of 9,800 square yards of asphalt pavement to a depth of 2-1/2 inches and full depth repairs to heavily deteriorated pavement areas, the replacement of deteriorated concrete medians and curbs, the installation of concrete pavement pads surrounding the catch basins and the replacement of catch basin grates, the widening of the entrance off Brookpark Road, the installation of a protective pavement membrane system, the resurfacing of Walcott Road with 2-1/2 inches of new asphalt concrete and the application of pavement markings. Walcott Road is the main entrance to the Lewis Research Center. Although this roadway has received regular maintenance, it now requires major repair to offset the deteriorating effects of heavy traffic and the use of salt to melt snow and ice.

6. Repair Distribution Chilled Water Piping Between Refrigeration Building (9) to Engine Research Building (5)..... 415,000

This project provides repair by replacement of a 12-inch underground supply and return distribution piping system with approximately 1,300 linear feet of insulated 16-inch supply and return distribution piping from Refrigeration Building (9) to Engine Research Building (5). The new pipe routing will be along the exterior wall of Building 9, then underground into Building 5.

The existing system supplies chilled water to Buildings 3, 5, 6, 7, 23, 38, 60, and 77 for cooling control rooms, laboratories, and offices. If this system fails, all eight buildings would lose cooling for an extended length of time, affecting many research rigs. Replacing the piping eliminates the possibility of a failure of service to these installations. The chilled water supply and return piping, is over 30 years old, and is buried 10 feet under Ames Road which makes maintenance extremely difficult. Because of the age of the piping and the scheduled future increases in chilled water requirements, replacement of these lines is critically needed at this time.

7. Repair of Roofs, Buildings 301 and 309..... 320,000

This project consists of the repair of approximately 42,000 square feet of roof on Electric Propulsion Laboratory 301 and 7,000 square feet of roof on Space Power Research Laboratory 309. The work includes the removal of some portions of roofs to the roof deck. Existing roof penetrations will be reconstructed to current standards. Obsolete roof equipment, out of service and no longer needed, will be removed. A Class A fire

underwriters approved roofing system will be installed with the necessary roof insulation to meet current ASHRE standards. Roof surfaces in pedestrian traffic areas will be protected with roof walkways. These roofs, despite periodic routine maintenance, have now deteriorated to a point where extensive repair is now necessary. The roofs are over 20 years old and repairs are required to prevent damage to the building structure and equipment contained therein.

I. Marshall Space Flight Center (MSFC)..... 955,000

1. Repair/Replacement of High-pressure Gas System.. 460,000

This project provides for a continuing program to replace unreliable sections of the high-pressure gas pipelines which support vital MSFC laboratory and testing activities. Following the gaseous hydrogen (GH_2) explosion at Test Stand 500 and the fatal gaseous nitrogen (GN_2) asphyxiation accident at KSC, a plan was formulated to upgrade critical, high priority portions of the MSFC pipelines to meet current safety standards. These 25- to 30-year old systems have exceeded their design life, and increasing failure rates are being experienced. The work under this phase includes replacement of approximately 8,500 feet of GN_2 and GH_2 piping to eliminate potential hazards due to corrosion and possible leakage.

2. Repair Roofs, Various Buildings... 495,000

This project is part of a 15-year roof repair program to rectify blistering, soft spots, drying-out, and deteriorated insulation. These roof repairs are essential to protect and preserve facility capability and to remove the threat of unscheduled interruption to MSFC operations. The most severely deteriorated roof areas of Buildings 4250, 4491, 4493, 4494, 4619, 4663, 4708, 4711 and 4712 are scheduled for repair. Under this project, approximately 202,000 square feet of roofing will be repaired. This includes replacing roofs, insulation, damaged flashing and resaturating roof surfaces to a firm smooth final finish.

J. Michoud Assembly Facility (F)..... 1,665,000

1. Repair to Chemical Cleaning and Plating Facility (103)..... 490,000

The chemical cleaning and plating facility in Wlilding 103 is where the ET barrel panels are cleaned and deoxidized. This facility has been in operation for approximately 17 years and is in critical need of repair in certain areas to provide continued reliability. This project provides for the relining of seven chemical tanks, replacement of approximately 200 feet of piping and valves and general rehabilitation to selective exhaust duct systems. A lined containment pit will also be provided, to contain trichloroethylene

(nonflammable solvent liquid used as a degreasing agent for metals) spill for disposal and/or recovery in accordance with EPA regulations.

2. Repair Roof, Office Building (102)..... 480,000

This project provides for the replacement of approximately 59,000 square feet of roofing on Office Building 102. The work includes removal of deteriorated roofing material, installation of new vapor barrier, insulation, built-up roofing, and flashing. The roof is in need of major repair to prevent structural and interior damage due to leakage. The roof has been patched several times, but the roof area still has numerous leaks, soft spots where insulation is saturated, and blisters due to trapped moisture.

3. Repair Electrical Feeder #4..... 235,000

This project provides for the replacement of approximately 2,209 feet of underground electrical feeder cable. Feeder #4 supplies electrical service to the ET components spray-on foam insulation (SOFI), machining, and the tool fabrication area located in the main manufacturing Building 103. The existing 13,800 volt feeder is approximately 40 years old, deteriorating, and has exceeded its expected useful life. The new feeder will be ethylene propylene rubber insulated cable, shielded with a polyvinyl chloride jacket. Four oil switches, for which replacement parts are not available, will also be replaced.

4. Repair Cooling Tower... 460,000

This project provides for the repair of the existing cooling tower, which is a heat transfer unit, serving the trichlorethylene recovery system, various chillers and other critical x-ray and production machinery in the main manufacturing Building 103. The internal structural timber members and wood fill have deteriorated and require replacement. The pumps and piping require replacement due to corrosion and mechanical deterioration. A drain line to the chemical waste pond will be installed to provide proper disposal of chemical Contaminants from the process water tower. A roof shelter over the blower fans will also be provided for weather protection.

- K. National Space Technology Laboratories (NSTL) 2,425,000

1. Repair to Static Firing Test Stand..... 450,000

This project provides for the preparation and application of preservation coatings to exposed metal structures of facilities within Complex B, including the Static Firing Test Stand, Positions B-1 and B-2 instrumentation towers, LOX and LH₂ Transfer Docks, RP-1 Ready Storage Area, High Pressure Gas Storage Battery and two observation bunkers. These facilities were constructed in 1956 and the constant exposure to the

environment has resulted in extensive corrosion and deterioration on the Static Firing Test Stand and its supporting facilities.

2. Repair Electrical Feeder #22..... 355,000

This project provides for replacement of a 13.8 kV underground cable system (Circuit #22) in the NSTL Administrative Area. The work involves cutting and removal of the existing cable and splices and reinstallation of 12,000 lineal feet (L.F.) of single conductor 500 MCM cable and 16,500 L.F. of single conductor #1/0 cable. Primary electrical power is provided to the NSIL Administrative Area through two 13.8 kV underground cables (Circuits #12 and #22). Service is routed to several critical government operated computer facilities and the central heating facility. The original cables were installed in 1964 and 1965. In 1974, due to a high incidence of power failures, Circuit #12 was replaced. At the present time Circuit #22 is in poor condition and must be replaced to improve the reliability of the power distribution system to the Administrative Area.

3. Repair of High-Pressure Gas (HPG) and Cryogenic Distribution System Components.. 450,000

This project provides for continuation of a multiyear plan to repair the HPG and cryogenic system components within the Space Shuttle Main Engine (SSME) complex, cross-country HPG systems, and base facilities. Many components in the HPG and cryogenic systems are 12 to 15 years old and have been subjected to severe use and stress, including submersion, electrolytic corrosion, and periodic removal and chemical cleaning during system maintenance. Many of the components are obsolete and spare parts which cannot be acquired must be fabricated. With the extremely high operating pressures, in addition to normal wear and tear, their continued deterioration constitutes a safety hazard to both personnel and equipment. The work will include the following: component disassembly, cleaning and repair; reassembly and installation; and system certification on completion of installation activities. The components to be repaired include 20 pressure regulator valves, 20 relief valves, 120 manual valves, and other related components.

4. Repair of Sanitary Sewer System 475,000

This project provides for the repair of the NSIL Sewage System which includes: relining 820 feet of 8 inch sanitary sewer lines; replacing 2923 feet of gravity and force main lines; grouting 5,430 feet of sewer lines; sealing approximately 106 manholes; and other related work. The sewage system provides for the sanitary collection, conveyance and treatment of domestic wastes generated at NSTL. The system is approximately 20 years old and is deteriorated from infiltration by ground water caused by broken pipe, cracked joints, and root penetrations along with inflow of surface water. This condition is seriously overloading the sewage treatment plant and requires immediate correction.

5. Repair of Underground High Temperature Hot Water Lines 475,000

This project provides for repair of the underground High Temperature Hot Water (HTHW) piping system insulation in the test complex area from the heating plant to the SSME Test Control Center, A-1 and A2 Test Stands and Data Acquisition Facility. Repairs will include: excavation of pipe system; installation of an appropriate insulation system around the pipe for protection of the underground line; installation of a subdrainage system to drain the sand backfill envelope around the pipe; and repair or replacement of the pipe and casing as necessary. The underground HTHW piping system provides energy from the heating plant to major buildings throughout the site to drive absorption chillers and heating equipment in the HVAC systems. This underground piping is susceptible to ground water leakage which saturates the pre-formed calcium silicate insulation on the pipe and results in both excessive heat loss and deterioration of the pipe. Failure to repair the piping system and insulation at this time would result in continued energy waste, accelerated pipe system deterioration, and unacceptable risk of loss of this system due to pipe failure.

6. Repair Roads..... 220,000

This project provides for the repair of portions of two of NSTL's major access roadways, road "A" and Old Highway 843. The repair will consist of repairing isolated base course failures, then over-laying the entire roadway with an 1-1/2" bituminous asphalt topping. In addition, roads repaired will be restriped in accordance with the Manual of Uniform Traffic Control Devices.

L. Wallops Flight Facility (WFF) 1,555,000

1. Repair Electrical Distribution System.. 375,000

This project provides for repairing the electrical distribution systems on the Main Base, Mainland and Island areas of the Wallops Flight Facility. This project includes cleaning and repairing main electrical switchgear, installing electrical isolation switchgear for isolation of the Mainland and Island electrical distribution systems, replacing deteriorated poles, and repairing defective transformers. Work also includes waterproofing walls and replacing the roofs on switch houses in the substation, Wlilding Y-64. Due to deterioration and the WFF corrosive salt- air environment, these repairs are essential at this time.

2. Repair Sewage Treatment ~~Plat~~..... 360,000

This project includes replacement of the comminator, repair of the primary and secondary clarifiers (including new equipment), replacement of the distributor for the trickling filter, repair of the chlorination system, conversion of the digesters to an aerobic type, repair of the sludge drying beds, and replacement or

repair of pumps, valves, safety railings, and concrete structures and surfaces. The sewage treatment facilities have two separate treatment trains consisting of dual trickling filters and primary and secondary clarifiers. One of the systems is presently operational, however, several essential components require repairs. The second system is inoperative and in need of major repair before it can be put on line. The Commonwealth of Virginia sewage regulations require that for plants rated at greater than 40,000 gallons per day, a fully operational dual train is required.

3. Repair AN-FPS-16 Radar Station (Y-55) 275,000

This project includes the repair of the roof; painting and repair of gratings, stairs, and other exterior metal items; sealing of concrete block walls; replacement of corroded metal doors, damaged ceiling systems, and worn tile flooring; replacement of lighting systems; upgrading of the mechanical system; and refinishing of the interior walls of this radar station. This 25-year-old facility has had only patch work repairs over the years, and must be restored to provide adequate, watertight housing for the AN-FPS-16 radar station equipment. This is the main launch tracking station on Wallops Island, and must be kept operational to support WFF programs.

4. Repair of Radar Operations Building (U-25)..... 195,000

This project provides for the repair of the 3,800 square foot radar operations building (U-25). The work includes the repair of the air-conditioning system; replacement of worn floor tile and discolored ceiling systems; and weather proofing and insulation of the exterior walls. This 25-year-old facility has not had any major maintenance for several years and must now be repaired in order to provide adequate, watertight housing for the radar instrumentation and experiment activities. The work must be accomplished in this time frame to preclude corrosion-related failure of building systems. This could result in shut down of or damage to the radar system, which supports weather related atmospheric research.

5. Repair of Rocket Assembly Building (W-65) 350,000

This project provides for the repair of the 19,700 square foot north launch area Assembly Building (W-65). The work includes the repair of six air-handling units, electrical systems, ductwork, blast panel wall units, partitions, sunken concrete floors, restrooms, repair and painting of exterior metal surfaces and the waterproofing and painting of exterior walls. This facility must be repaired now to correct the accelerating deterioration of building systems if it is to continue supporting launch activities from the island's north launch areas.

M. Various Locations. 690,000

1. Repair DSN Grounding Systems, Goldstone, California..... 240,000

This project provides for the repair of the equipment grounding systems at DSN Complex, Goldstone, California. Work includes repairs to the electrical power safety grounding system to provide protection for personnel and equipment against electrical faults and lightning strikes. Work also includes the replacement of deteriorated components in the electronic equipment grounding systems. The present electrical power safety and electronic equipment grounding systems have been in use for 15 years and are deteriorated. This project will restore the functional reliability of these critical tracking station grounding systems.

2. Repair Water Distribution System, Goldstone, California.. 450,000

This project provides for the repair of the water distribution line and equipment at Goldstone Deep Space Communications Complex, California. Work includes: replacement of deteriorated water supply lines; retrenching and reinstallation of existing pipes that have been exposed; encasement of pipes in concrete where necessary for protection; replacement of control valves and instrumentation. Also included is repair of the water storage tank system to assure sufficient water supply for fire suppression and critical on-line tracking systems. The repair to this 15-year-old water system is needed to correct deterioration, protect it from the adverse desert environment, and assure reliability for critical support to the entire Goldstone tracking complex.

MISCELLANEOUS PROJECTS LESS THAN \$150,000 EACH..... 295,000

TOTAL..... 20,000,003

FUTURE Cof ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated \$20,000,000 to \$25,000,000 per year will be required for the continuation of this essential repair program.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

SUMMARY

REHABILITATION AND MODIFICATION

<u>Summary of Project Amounts by Location:</u>	<u>Amount</u>	<u>Page No.</u>
Ames Research Center	1.985. 000	CF 10-3
Dryden Flight Research Facility	360. 000	CF 10-5
Goddard Space Flight Center	1. 180. 000	CF 10-5
Jet Propulsion Laboratory	2.105. 000	CF 10-6
Johnson Space Center	2, 255, 000	CF 10-8
Kennedy Space Center	2.070. 000	CF 10-10
Langley Research Center	2.895. 000	CF 10-11
Lewis Research Center	2.800. 000	CF 10-14
Marshall Space Flight Center	2.730. 000	CF 10-16
Michoud Assembly Facility	1.850. 000	CF 10-19
National Space Technology Laboratories	960. 000	CF 10-20
Wallops Flight Facility	2.615. 000	CF 10-21
Various Locations	750. 000	CF 10-23
Miscellaneous Projects Not Exceeding \$150. 000 Each	445. 000	CF 10-23
Total	<u>25.000. 000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	<u>Rehabilitation and Modification of Facilities at Various Locations, Not In Excess Of \$750,000 Per Project</u>		
INSTALLATION:	<u>Various Locations</u>		
		FY 1985 CoF ESTIMATE:	<u>\$25,000,003</u>
FY 1983: \$19,000,600		FY 1984: \$21,500,000	

COGNIZANT INSTALLATIONS LOCATION OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE :

These resources will provide for the rehabilitation and modification of facilities at NASA field installations and Government-owned industrial plants supporting NASA activities. Included in this request are those facility rehabilitation and modification needs for FY 1985 that have been fully identified at the time of the submission of these estimates, and that are estimated not to exceed \$750,000 per project. The purpose of this program is to restore or enhance the condition of a facility so that it can more effectively accomplish its designated purpose or increase its functional capability.

PROJECT JUSTIFICATION:

Based on the initial investment costs, the NASA Capital Type Property totals approximately \$8.0 billion (September 30, 1983), of which the physical plant comprises some \$3.3 billion. A continuing program of rehabilitation and modification of these facilities is required to:

- a. Protect the capital investment by minimizing the cumulative effects of wear and deterioration;
- b. Ensure that these facilities are continuously available and that they operate at peak efficiency;
- c. Improve the capabilities and usefulness of these facilities and thereby mitigate the effects of obsolescence;
- d. Provide a better and safer environment for all personnel; and
- e. Provide significant reductions in energy consumption through the initiation of energy conservation projects including improved utility control systems.

This program includes only facility rehabilitation and modification work having an estimated cost not in excess of \$750,000. The work is of such a nature and magnitude that it cannot be accomplished by routine day-to-day facility maintenance or by related routine facility work efforts that are provided for in other than CoF estimates.

PROJECT DESCRIPTION:

Proposed rehabilitation and modification projects for FY 1985 totaling \$25,000,000 are described under "PROJECT COST ESTIMATE." Only those projects estimated to cost less than \$150,000 have not been individually described or identified by Center. The total cost for these miscellaneous projects is \$445,000. The total program of \$25,000,000 has been distilled from requests of approximately \$42,000,000 and represents only a modest request in relation to the backlog of this type of work. Based on relative urgency and expected return on investment, the projects which comprise this request are the highest priority requirements. Deferral of this mission-essential work would adversely impact the availability of critical facilities, program schedules, and energy conservation objectives.

During the course of the year, some rearrangement of priorities may be necessary. This may force a change in some of the items to be accomplished. Any such change will be accomplished within available resources.

The following broad categories of work are described further in the "PROJECT COST ESTIMATE:"

a. Utility Systems	2,615,000
b. Fire Detection/Protection Systems.	2,695,000
c. General Purpose Buildings	5,630,000
d. Technical Buildings/Structures ..	13,655,000
e. Building Exteriors and Roofs	405,000

PROJECT COST ESTIMATE:

A. <u>Ames Research Center</u> (ARC)..	1,985,000
1. Modifications of Various Buildings for Safety..	215,000

This project will correct safety deficiencies identified in 20 buildings. Corrections include exit routes for fire and other emergencies, provision of one-hour fire resistant exit enclosures, addition of sufficient exits to meet fire codes, and correction of stair and ladder hazards. Modifications of two paint spray booths are required to eliminate electrical hazards, provide adequate filtering, and provide an adequate fire protection system. The safety deficiencies have been identified during comprehensive safety inspections of Ames facilities. This project addresses the most serious safety deficiencies which are considered to be fire related or potential injury causing situations.

2. Modification for Technology Utilization Facility (N-233)..	495,000
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Because of space limitations, Ames carries out public information functions in several locations both on and off the Center, making accessibility difficult for educators and other interested citizens. These functions include the Public Affairs Office, media services, educational programs, libraries for the technical files, technical publications, still photographs, audio tape, and administration of the Freedom of Information Act. On site facilities are scattered and off Center space is expensive, e.g., lease of film library space in Mountain View, California, costs over \$37,000 per year. A building, previously a chemistry laboratory, is available for modification which will allow consolidating the public information facilities and materially improving operations of these functions. Located near the Center's entry gate, it will also provide a single area, open to the public without a security pass, for access to NASA materials.

3. Rehabilitation and Modification of Balance Calibration Laboratory (N-207)..... 495,000

The wind tunnel model balance system is one of the most critical instrumentation elements in wind tunnel tests. Calibration of the balances is difficult, and the calibration equipment is sensitive to vibration, temperature, and humidity fluctuations. The existing laboratory has limited heating and cooling capacity and is therefore unable to provide a properly controlled environment. More importantly, the laboratory is under the 14-foot wind tunnel shell and is affected by vibration when the tunnel is running. Because of the poor conditions in the laboratory, accuracy of the balance calibration is unreliable. This project will rehabilitate space in nearby Building N-207, replace an adjacent metal shed with a pre-finished metal building, provide controlled environmental space, relocate the calibration machinery onto vibration isolation pads, and provide a small jib crane to safely handle the balances and calibration equipment. This project will allow balance calibration to be done with an accuracy and reliability not previously possible.

4. Modifications for Vestibular Research and Variable Gravity Facility (N-242)..... 340,000

This project will modify existing storage space into a laboratory that will be used to investigate space motion sickness. The laboratory will fill a unique role in this research in that it will contain in one area morphology and histology laboratories, an animal holding room, a centrifuge, a human rotator system and control room, supporting computer equipment, and other mission support space. The facility will support the Spacelab flight program investigations into the causes and cure of space adaptation syndrome. The required research capabilities are not available elsewhere. This project will increase floor loading capacity, provide walls and doors where needed, and provide air conditioning, plumbing, and electrical service. A small animal surgical suite will be included for implantation of vestibular instrumentation.

5. Rehabilitation for Program Support Communication Network (N-254)..... 440,000

The Program Support Communication Network (PSCN) includes computer data transfer, voice and video teleconferencing, FTC communications, and facsimile services between Ames and other NASA Centers. Because DFRF is now a sub-element of ARC, better communication service between both locations is essential. The required quality and quantity of communications lines, with state-of-the-art computing power and data transmission, requires a dedicated PSCN facility. A concrete building, previously a fire test facility, is available for modification and will provide an economical communications network terminal. The project will provide a second floor inside the building shell. It will also provide building utilities, special power, and raised computer flooring for communications equipment, and a small building addition for two story entry which includes restrooms and freight elevator.

B. <u>Dryden Flight Research Facility</u> (DFRF).....	360,000
1. Rehabilitation of Electrical Distribution System	360,000

The Dryden electrical distribution system was constructed in 1954, and since then, has been added to and modified without the benefit of long range planning of load requirements. This project will correct the major deficiencies by reducing loads on an overloaded substation; replacing an old substation in poor condition for which parts are no longer available; reducing emergency load demands on stand-by generators; paralleling emergency generators; replacing facility feeder cables; replacing pole-mounted disconnect switches on several power poles with poor accessibility; and replacing a small substation and distribution system in a trailer area which is in poor condition because of flooding and corrosion. These rehabilitations will upgrade the Dryden electric distribution system to eliminate deficiencies which have created major operational problems.

C. <u>Goddard Space Flight Center</u> (GSFC).....	1,180,000
1. Rehabilitation of Electrical System, hilding 3/14..	430,000

This project provides for the replacement of four main breakers and two tie breakers for the switchgear in the Central Flight Control and Range Operations Building (3) and the Spacecraft Operations Facility (14). To be replaced are 2-4,000 ampere main breakers, 2-1,600 ampere main breakers, 1-4,000 ampere tie breaker, and 1-1,600 ampere tie breaker. Also included is the installation of five distribution sub-panels and an additional electrical service to each office in this building complex. The main breakers and tie breakers were installed in the early 1960's as part of the original building electrical equipment. Due to the worn condition of the spring force retention parts, the breakers may plunge into a closed circuit position without manual activation during reset. This sudden closing is a dangerous condition for the maintenance personnel. In addition, the breaker manufacturer has ceased production of spare parts. The installation of the sub-panels is necessary to correct the overloaded electrical distribution system serving the administrative areas of this complex,

2. Modifications of Spacecraft Operations Facility (14).....	465,000
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This project provides for architectural, mechanical, and lighting modifications for the existing Project Operations Control Center (POCC) in the Spacecraft Operations Facility. The work includes the lowering of 25,000 square feet of metal pan ceiling and replacement with acoustic ceiling; modification of fire detection, sprinkler, and HVAC systems to accommodate ceiling changes; replacement of lighting fixtures with high efficiency type fixtures; modification of overhead air-conditioning ductwork; replacement of inadequate, and old variable air volume boxes; and relocation of partitions. The existing facility is over 20 years old and the HVAC,

ceiling and lighting systems require these modifications to permit better maintenance, improve lighting and environmental systems, and to replace deteriorating equipment.

3. Modifications for Fire Protection and Safety..... 285,000

This project provides for modifications to trailer pads throughout GSFC to furnish improved fire protection and safety. The work includes the extension of the fire detection system to all instrumentation and related support trailers and vans. Trailers are inherently poor fire risks. Their light construction, often with makeshift utility systems and wiring, increases fire potential and fire severity. Fire detection systems at these facilities are an economic and safety necessity. Also included is the modifications to Buildings 2 and 18 to eliminate dead-end halls without exits. The exit deficiencies are considered to be the most prominent life safety problems at GSFC and must be remedied to meet the standards of the National Life Safety Codes.

D. Jet Propulsion Laboratory (JPL)..... 2,105,000

1. Modification of Applied Mechanics and Telecommunications Building for Fire Protection.. 455,000

This project provides for modification of 105,000 square feet of Applied Mechanics (157) and Telecommunications (238) Buildings to improve life safety conditions. Work includes the installation of wet pipe sprinkler systems, fire alarms, and smoke detectors to attain an adequate level of fire protection. Also included is the extension of the fire service mains to the buildings. The fire detection and alarm systems will be connected to the main alarm console in Building 281. This project is necessary to protect approximately 500 personnel, and facilities and equipment valued at over \$10,000,000.

2. Modification of 25-Foot Space ~~Simulator~~..... 265,000

This project provides for the modification of the air conditioning system for the high bay clean rooms of the 25-Foot Simulator, Building 150. Work includes the installation of dehumidification equipment in the air handling system to provide critical control of space temperature and humidity. Also included is refurbishment of the humidifiers, addition of filters, and modification to the air supply system. The space simulator facility is used for all JPL spacecraft projects. The clean rooms for testing of spacecraft hardware must be capable of maintaining a precise environment which is contaminant free with uniform controlled temperature and humidity.

3. Modification of Chemical Exhaust System, Physical Sciences Laboratory.. 485,000

This project provides for the modification of the chemical and toxic fume exhaust systems in the Physical Sciences Laboratory, Building 183, to improve operational safety and temperature control. Work includes replacing 23 chemical fume hoods and modifying the related exhaust system. Also included are modifications to the return air ducts, controls, filters, and steam coils. Building 183 was originally constructed as a wet chemistry laboratory, but program changes have altered the occupancy. Computers and other equipment have replaced some chemistry activities, increasing the equipment heat rejection and establishing areas requiring temperature and dust controls. The fume hoods have deteriorated and must be replaced. This modification of the HVAC system in Building 183 is needed to adequately support the laboratories spacecraft related activities.

4. Rehabilitation of HVAC System, Spacecraft Assembly Facility.. 485,000

This project provides for the rehabilitation of the heating, ventilating and air-conditioning (HVAC) system in the Spacecraft Assembly Facility, Building 179. Work includes the interconnection of two chiller plants and three boiler rooms to provide back-up capability and improve system reliability. Modifications will be made to permit positive dehumidification control. The environmental monitoring system will be expanded and connected to the Utility Control System. This project is required to improve conditions for testing of highly sensitive spacecraft assemblies within the high-bay clean rooms. During periods of diminished activity, the total needs of the building can more efficiently be supplied from a central cooling and heating plant operating closer to its full load rating.

5. Modification of Utility Control System... 415,000

This project provides for the modification and expansion of the Utility Control System (UCS) at JPL. Work includes the addition of 280 data points, monitoring units, cables, motor controls and related modifications in 22 buildings. Included in this work is the addition of the Physical Science Laboratory, Building 183, and the Space Flight Operations Facility, Building 230 to this system. The UCS has been in operation at JPL since June 1982, and employs approximately 1,000 data points to monitor the HVAC systems in portions of 34 buildings. The modification and expansion of the control points will permit wider UCS coverage and energy savings of approximately \$200,000 for first full year of operation.

E. Johnson Space Center (JSC)..... 2,255,000

1. Modifications for RNC System, Mission Operations Wing 200,000

This project provides for the installation of a Reconfiguration Network Computer (RNC) system in the Mission Operations Wing of Building 30. This system will provide rapid electronic data transfer between the JSC computers supporting the Space Shuttle data reconfiguration activity. Rapid, automated data transfer is required to support high flight rate requirements and to eliminate inefficient transfer of data by magnetic tapes. The work includes installation of raised floor, construction of fire resistant walls and tape library, installation of air-conditioning, distribution of electrical power, installation and grounding for computer equipment, and installation of fire detection and suppression systems.

2. Rehabilitation of Vacuum Systems (7)..... 365,000

The present vacuum systems in Building 7 have been in use for over 18 years and were equipped with pumps that were Air Force surplus property in 1964. Considerable downtime is being experienced due to the age of the pumps and difficulty in obtaining parts. The chambers in this building are used for Shuttle flight crew familiarization and training. Without rehabilitation of these vacuum systems, crew training schedules and quality will be impacted. Included in this project is the repair/replacement of vacuum pumps and blowers, valves, and piping. Also included is the installation of crossover piping and isolation valves necessary to provide redundant vacuum system capability for the 11-foot chamber complex.

3. Modification for Advanced Antenna Testing (14) 490,000

This project provides for modifications to Building 14 to enable near-field testing of large spacecraft antennae up to 40 feet in-diameter, operating at frequencies above the Ku-band (15 GHz). Advanced space communications requirements will utilize antennae of this size and frequencies. Presently, the current JSC test capability is limited to 2-foot diameter antennae. Modification of this facility is a very cost effective approach to meeting the future antenna development and validation testing. This project provides and installs an overhead precision carrier for mounting an antenna probe in the anechoic chamber. Also included are modifications for the installation of a support computer.

4. Rehabilitation of Flight Operations Support Facilities, Ellington Air Force Base.. 475,000

This project is a continuation of a multiyear program for rehabilitation of NASA's Ellington Air Force Base (EAFB) aircraft operations support facilities. These facilities were originally constructed for the Army Air Corps in 1942 and have been in continuous use with minimal maintenance. This project consists of

rehabilitation of aircraft mooring apron expansion joints and also includes the rehabilitation of mechanical, electrical, and structural components of the various utility systems projected to consist of repair/replacement of three transformers, two substations, transmission line drops to three buildings, three air handlers, two boilers, two control air compressors, and ten exhaust fans. Additionally, this project provides for roof rehabilitation consisting of replacing approximately 27,900 square feet of high bay built-up roofing and 20 percent of the roof insulation on Hangar 276, and replacing approximately 22,200 square feet of asphalt shingle roofing on Warehouse 265 and 270.

5. Modification for Advanced Communications System Testing (44). 260,000

This project provides for the extension of the high bay mezzanine floor area by approximately 522 square feet in Building 44 to accommodate an additional radiofrequency (RF) shielded enclosure. This will permit supporting simultaneous multiple communications link tests at Ku-band and millimeter wavelengths (above Ku-band) for RF systems development and end-to-end system certification prior to first manned utilization. Present capability, which includes Orbiter ultra-high frequency, S-band, and Ku-band frequencies, cannot be expanded to meet future test requirements without this project. Developmental test configurations require that distances between shielded enclosures be kept to a minimum to control losses and permit operation at low RF power levels. This new area will be less than 30 feet vertically from the existing test facility and its interconnection points, thereby minimizing the cost and complexity of test operations. In addition to structural, air-conditioning, and electrical work, a new 16 x 20 x 12 foot RF shield room will be installed on the mezzanine to provide 100-dB attenuation of RF energy to 100 GHz.

6. Rehabilitation of Fire Alarm Panels, Various Buildings.. 465,000

This project is the first part of a multiyear program to provide for the replacement of the old fire alarm annunciator panels in Buildings 1, 4, 7, 7a, 8, 9, 10, 11, 12, 15, 16, 16a, 17, 24, 29, 31, 32, 32a, 35, 44, 45, 222, 223, 322, 422, and 423. The work includes removing existing annunciator panels, installing new fire alarm control panels, replacing high voltage ionization detectors in seven buildings, replacing sensors and end-of-line devices as required, and modifying existing alarm circuits as required. Increasing failures, repairs, and maintenance efforts are being experienced with the building fire alarm panels. The panels are approximately 20 years old and are no longer manufactured. Substitute parts acquired or fabricated onsite do not always provide the same level of function or reliability.

F. <u>Kennedy Space Center (KSC)</u>	2,070,000
1. Modify Sewage Treatment Facilities	190,000

This project provides for the installation of a new sewer line from the Vertical Processing Facility (VPF) to the Hypergol Maintenance Facility (HMF) and then to an existing manhole at 3rd street and "C" Avenue in the KSC Industrial Area. Both Waste Water Treatment Plants #2 at HMF and #13 at VPF are overloaded, and the HMF plant is also in need of refurbishment. Tying these areas into the Central Industrial Area system will reduce operating costs and increase the efficiency of the central sewer plant which is designed for 375,000 GPD and presently operates at about 25 percent of capacity. The new line will include 8,300 feet of 4-inch high pressure PVC pipe, manholes, lift stations and 1,800 feet of 8-inch PVC gravity sewer pipe. The existing WWT plants #2 at HMF and #13 at VPF will be removed.

2. Modify Photographic Laboratory in KSC Headquarters Building..	220,000
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This project disconnects the photographic laboratory in the KSC Headquarters Building from the central system chilled water supply and installs a new chiller of approximately 100 tons capacity with its own chilled water pump. This will provide full design flow to the cooling coil of the laboratory air handler, allowing the coil to operate at its rated capacity which will lower the excess humidity within the photographic laboratory. The existing central system connection is too small and present usage does not provide for proper humidity conditions required in the laboratory area. High humidity is resulting in corrosion of expensive photographic equipment, rapid deterioration of negatives and low quality of negative reproduction.

3. Modifications to Heating, Ventilating and Air-conditioning Systems for Energy Conservation, Various Buildings.	340,000
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This project provides for modifications to the HVAC systems of seven buildings to conserve energy. The modifications include replacement of boilers, exhaust fans, controls, and air handlers in Buildings K7-1557, M7-351, M7-409, J7-337, J8-1708, and 44635 appropriate for current usage. These facilities house laboratories, shops, clean rooms, assembly areas, office space and support functions which are critical to Center operations. As originally designed and constructed, most of these facilities have greater heating, ventilating and cooling capability than is necessary to support current or future mission requirements. Personnel usage has changed in most buildings and, in some cases, entire building use has significantly changed. This project will better match equipment with loads and provide more accurate controls.

4. Installation of Vents in the Vertical Assembly Building (VAB) South Horizontal Door..... ■ 175,000

These resources provide for removal of existing horizontal door vents and siding, and installation of a new vent system in the VAB. The existing vent system is inoperable. This project will provide new vents which will cover the entire surface area of the door, approximately 5,000 square feet. This additional vent area is required to assure sufficient air flow through the entire low bay in the event of an SRM incident.

5. Rehabilitation to Pad B Fence..... 495,000

This project provides for modifying the Launch Complex-39 Pad B perimeter fence to improve access control and accommodate monitoring instrumentation equipment required to secure the STS vehicle and launch facilities. Approximately 10,000 linear feet of 7-foot high fence, posts, crash-out gates, outriggers, and barbed wire will be replaced by an 8-foot high fence constructed of a 9-gauge or heavier galvanized steel fencing material. The existing fence has been weakened by corrosion and has many rusted posts which are broken off at the ground level. Several outriggers and much of the barbed wire are also rusted and have fallen off the fence.

6. Modification for Additional Cabling, Pad B to VABR 650,000

This project provides for modification of the existing Pad B wideband transmission system by installing in existing ducts approximately 5.8 miles of fiber optic cable between Pad B and the Vertical Assembly Building Repeater (VABR) Station Launch Complex 39. The installation includes splices and terminations along the route and will be routed through the Launch Control Center (LCC). This project is necessary to provide adequate communication capability for shuttle and cargo checkout and launch at Pad B. This upgrade will provide the same capability at Pad B that presently exists at Pad A. The existing Pad B wideband transmission system, originally installed for the Apollo program, consists of 140 pairs of copper wire. The present cabling requirement is for a minimum of 165 pairs. The fiber optic cable will have a bandwidth advantage over the copper pairs up to 100 MHz, allowing more flexibility in multiplexing data and video signals and providing a more secure communications network.

G. Langley Research Center (LaRC) 2,895,000

1. Modifications for the Display Device Research Laboratory (1298).. 470,000

The proposed modifications provide a variable intensity lighting system and a solar simulator that will allow various cockpit display devices to be evaluated over a wide range of lighting conditions. These evaluations are essential to provide a data base for various display media which have potential application

as cockpit display devices. Existing lighting systems cannot provide the intensities needed to support this research. This project will provide lighting for the displays, a solar simulator to provide artificial daylight, power and fire alarms to support the lab. The mechanical work includes heating, ventilating, and air-conditioning modifications to accommodate the increased cooling load created by the solar simulator and lighting systems.

2. Modifications of Propulsion Test Cell No. 1 for New Heater Liner and Facility Nozzle (1221)..... 255,000

This project will provide for modifications to the Propulsion Test Cell No. 1 to increase the Mach number simulation range of the facility. Currently, the facility is capable of Mach 4 flight simulation. Included in the project are a new pressure vessel (combustion chamber) with an internal heat sink liner and a new Mach 4.5-5 nozzle. This increased capability provides for a test region over which both missile and airplane engines are currently being studied. This is in support of ramjet and scramjet research.

3. Modifications for Acoustic Treatment of the Heated, Coannular Supersonic Jet Noise Facility (1221A)..... 250,000

This project provides for the installation of sound absorbing wedges in the jet termination area of the Jet Noise Facility. The ceiling, floor and all walls in the jet termination area will be covered with sound absorbing wedges. The primary purpose of the Jet Noise Facility is to accurately measure the decibel level and frequency range of various jet nozzle designs and configurations. The existing jet termination area of the facility has insufficient acoustical insulation to absorb the level of sound energy, and is not designed to prevent reverberation. Therefore, an acoustically "dead" space is required for precise instrument readings and calibrations of jet noise.

4. Modifications to Upgrade Fire Protection Systems, Various Facilities..... 405,000

This project provides for upgrading of the five protection systems in four facilities. The fire alarm monitor equipment in Building 1248 is the primary means of fire alert for facilities on the east and west sides of the Center. This project provides for the replacement of this monitoring equipment which has reached its full capacity of 150 monitoring points. In addition, parts are difficult to acquire. Buildings 640 and 1267 contain areas in which there are combustible materials that could cause significant damage both to life and equipment. Modifications to these buildings include the installation of automatic sprinkler protection in those critical areas. Lastly, an automatic deluge sprinkler system will be provided for the wooden induced cooling tower at Building 1267.

5. Modifications for the Advanced Technology Research Laboratory (1200). 735,000

This project provides for modifications to Building 1200 for laboratory space. This includes: (1) removing an existing mezzanine storage area and related structural supporting elements; (2) removing an existing overhead bridge crane; (3) modifying a high bay area to provide approximately 5700 square feet of second floor laboratory space; (4) providing RF shielding in the floor between the first and second floors and on the south wall of the existing capacitor bank; (5) providing stairways and restroom facilities; (6) insulating and covering existing interior walls; and (7) modifying the existing utility, heating, ventilating and air conditioning systems. These modifications will allow for research in advanced energy conversion with emphasis on high-power solar pumped lasers. A high energy laser in earth orbit offers a potential breakthrough in space transportation and power transmissions. This research effort must be started now to achieve a 1990's capability. Existing research facilities are subjected to environmental conditions that degrade the quality of the research effort.

6. Modifications to Access Monitoring System (1268)..... 385,000

The proposed project will provide for modifications to the access monitoring system for the Building 1268 Computer Complex. Currently, access security to the various computer facilities cannot be controlled on a selective basis. All areas are accessible to anyone with a card. This project will provide for a microprocessor based system using an automated card key locking system that will be programmable to allow access on a selective basis and provide audit trails of those entering and leaving restricted areas. In addition, a closed circuit TV monitoring and alarm system, and all necessary wiring and locks will be provided. This system is required for full compliance with ADP security requirements in accordance with OMB Directive A-71.

7. Modifications to the 6- by 28-Inch Transonic Tunnel to Provide Improved Flow Quality (583)..... 170,000

This project will provide an improved upstream diffuser, screens and fillets in the settling chamber of the 6- x 28-Inch Transonic Tunnel. The 6- x 28-Inch Transonic Tunnel is used to test helicopter and propeller airfoils. This project will improve the productivity and low-turbulence quality of this facility. This will result in an improvement in the quality of steady measurements and provide the necessary flow for dynamic measurements on airfoils.

8. Modifications to Heating Systems (1249)..... 225,000

This project will extend steam service from Building 1238 to Building 1249 in the warehouse area. The building system in this facility will be modified to convert from an oil fired to a steam system. Included

will be all necessary piping, valves, heat exchangers, and controls. A 125 psi steam line, condensate return line, and associated pumps will also be installed. Where the lines cannot be run through existing buildings, a shallow concrete trench with removable lids will be constructed. The oil fired heating system in hilding 1249 requires frequent maintenance and periodic replacement. Further, the separate No. 2 oil storage tanks are an added maintenance problem. Replacement of these systems with steam will provide safer heating, require less manpower, reduce the Center's use of No. 2 oil, and expand the Center's use of relatively inexpensive steam from the Refuse Fired Steam Generating Facility.

H. Lewis Research Center (LeRC)..... 2,800,000

1. Modifications for Fire Protection Systems, Various Buildings.. 395,000

This project provides for modifications to various buildings for installation of smoke detection systems. The systems will be installed in the Materials and Structures laboratories Building 49, the 8x6 Supersonic Wind Tunnel Complex (Buildings 53, 54, 55, 56) and the 10x10 Supersonic Wind Tunnel Complex (Buildings 85, 86, 87, 88, 90, and 114). The work includes installation of detector heads, associated controls, transmitter and display panels and emergency power backup together with necessary conduit and wire. Alarm signals will be connected to the central station protective signaling system to alert the LeRC fire station. The installation of smoke detection systems in these buildings will provide early warning of fires in the incipient stages thereby enhancing life safety and reducing fire and smoke damage.

2. Modification of Development Engineering hilding (500)..... 475,000

This project provides for modifications to Building 500 for the installation of office safety items to meet life safety requirements. The Building has a total floor area of approximately 162,000 square feet on three floors plus a basement. A recent study at Lewis indicated that this building design does not meet current building codes and standards, and contains fire safety deficiencies. The modifications will provide one hour fire rated stairwell enclosures, ceiling modifications, new emergency doors, exits, and emergency lighting.

3. Modification of Electrical System, Research Analysis Center (142).. 190,000

This project provides for the modification of the electrical system in the Research Analysis Center, Building 142. The work will add a new 150 kVA uninterruptable power system (UPS) and modify the existing electric supply systems for connections of the new UPS. The UPS will provide uninterruptable, regulated, electrical power to the existing on-line data acquisition systems. These systems are presently powered by an UPS which was originally installed to provide power to the large scale on-line digital computer. Planned

expansions in both the digital computer and in the data acquisition systems will exceed the full load capability of the *UPS* by approximately 50 percent. Providing a separate *UPS* for the data acquisition system will off-load the existing *UPS* and ~~will~~ permit the needed computer and data acquisition system expansions.

4. Modifications to Rocket Engine Test Facility (202) 490,000

This project provides for modifications to the Rocket Engine Test Facility (RETF) complex for rocket turbopump testing. Cryogenic propellants will be supplied to a new test building in approximately 1,000 feet of vacuum jacketed piping of sizes varying from 1 inch to 3 inch diameter. Service utilities such as service air, domestic water, hydraulic oil, and CO₂ will be supplied to the building in approximately 600 feet of piping varying in size from 3/4 to 2 inch. The new test building will be a 484 square foot structure that will be suitable for a gaseous hydrogen environment. The building will be provided with a combustible gas detection system and explosion proof lighting, and will be fitted with rollup doors on each side. The project will also include a cable and conduit system for instrumentation and for power to valves and components.

Future space missions for the 1990's indicate that individual payload mass requirements for transfer between low earth orbit and high or geosynchronous orbit will be increasing. Since current available upper stage vehicles have not been designed to satisfy these larger mass payload requirements, an advanced orbital transfer vehicle (OTV) propulsion system must be developed. The proposed facility will be used to develop turbopump components and systems in support of OTV engine technology required for the 1990-1995 time frame.

5. Rehabilitation and Modification of Utilities Building (15). 460,000

This project provides for the rehabilitation and modification of approximately 14,000 square feet of the south wing of Utilities Building 15 for the purpose of housing several employee service activities. The work includes installation of partitions, acoustical ceilings, replacement of floor coverings, modifications of heating, ventilating, and air-conditioning (HVAC) system, and plumbing, lighting, power, and communication systems.

Several employee services (Medical Service, Credit Union, Insurance Office) require additional and/or improved space. Concentrating these services in Building 15 provides a central location and more suitable quarters for each function and is in keeping with LeRC master facility consolidation plan. Building 15 when completely modified ~~will~~ also contain the telephone switching station and presently houses the main cafeteria. Relocation of the Medical Services to Building 15 will free additional area for research needs. The new medical facility will also provide a location which is more accessible for both personnel and for ambulance service.

6. Rehabilitation and Modification of Engineering and Supply Building (21)..... 490,000

This project provides for the rehabilitation of 29,000 square feet of the west office interior, first and second floor of Building 21. The work consists of new partitions, ceilings, flooring, rehab of HVAC system to include new piping, duct work and fan-coil units. Other work includes new lighting, communications, power panels, receptacles and smoke detection system and toilet area modifications to meet handicapped requirements. The west office area portion of Building 21 was constructed in 1944 and the second floor was constructed over the first floor in 1962. The interior rehabilitation is required to correct deteriorated conditions. The existing plumbing and mechanical systems are antiquated and frequent maintenance is required.

7. Rehabilitation and Modification of Cafeteria in Engine Research Building (5)..... 300,000

This project provides for modifications of the cafeteria in the Engine Research Building (ERB) to improve food preparation and service facilities. The size of the modified area when completed will be approximately 2,500 square feet. The work includes demolition, removal of existing partitions and mechanical/electrical systems, and the installation of new walls, ceilings, flooring, kitchen/working equipment, serving equipment, lighting/power and mechanical/plumbing systems.

The ERB cafeteria serves 30 percent of LeRC personnel. The existing facility in Building 5 is inadequate, inefficient, and unable to meet this volume of service. The modified area will provide greater seating capacity and efficient traffic flow in the serving area and through the cashiers stations. It will also provide for a greater storage capacity, food preparation area, refrigeration, and storage space.

I. Marshall Space Flight Center (MSFC)..... 2,730,000

1. Rehabilitate Shop Building. 430,000

This project provides for rehabilitation of mechanical, electrical, and architectural systems in Building 4705. Building 4705 is a sophisticated machine shop facility providing a unique fabrication and test capability which has supported and will continue to support all major space flight test and development programs, such as Shuttle, Spacelab, and Solid Rocket Booster. This building has been heavily used since its construction in the late 1950's and has now reached the point where general rehabilitation is required. The work will include relocation of an electrical potting laboratory; construction of a clean room work area; refurbishment of office space; installation of a 2nd floor restroom; removal of main floor crib area; installation of new fixtures in existing women's restroom; refurbish/recoat various shop area floors; refurbish a small laboratory; remove surplus damaged air compressors; relocate air-conditioning chiller from Building 4703 to Building 4705; and landscape exterior of south and east area.

2. Modifications for Uninterruptible Power System 455,000

This project provides for the installation of an Uninterruptible Power System (UPS) in "A" wing, Building 4663 to support eight "VAX" computer systems that will be used in the Huntsville Operation Support Center (HOSC). The HOSC will provide real time mission support to the Shuttle Spacelab, Space Telescope and Spacelab Payloads. Unreliable HOSC computer operations would drastically impact the Center's ability to accomplish its assigned Shuttle mission support. The UPS will eliminate electrical outages and variations in primary power to the HOSC computers and be backed up by a "stand-by" motor generator to provide a continuous "no fail" power system. The UPS unit will be located in Room 104 and the motor generator will be located outside of this room. The system is comprised of static rectifiers, static inverters, lead-calcium batteries, electronic oscillators and controls, capacitors, circuit breakers and other electrical components.

3. Modifications for Low Thrust Gaseous Hydrogen/Laser Propulsion Testing.. 460,000

This project will provide a test capability in hilding 4583 to investigate laser/hydrogen propulsion under simulated sea-level/altitude conditions, using existing laser equipment and vacuum test equipment. MSFC is investigating laser rocket engine technology and requires a test facility for low-thrust gaseous hydrogen thrusters at vacuum and sea-level conditions. The existing laser equipment located at the southeast side of Building 4583 will also be utilized. The work will include: foundations for relocated vacuum equipment; test position foundations and structures; terminal building; extension of instrumentation and control systems from Building 4583 to the test position; installation and construction of mirrors and controls necessary to direct the laser beam to the thruster test position; utility services and high-pressure gases. Also included will be the refurbishment of existing vacuum equipment.

4. Rehabilitation of Space Sciences Laboratory. 455,000

This project provides for rehabilitation of approximately 35,000 square feet of laboratory and office space in the Space Sciences Laboratory, Building 4481. Work includes renovating ceilings, restrooms, floors, walls/partitions, replacing lighting fixtures, insulating where necessary and painting. General upgrading and conversion of the HVAC and electrical power systems for energy conservation will also be accomplished. Building 4481 was originally constructed in 1943 and all of the building has been recently renovated except this 35,000 square feet. Rehabilitation of this area is required to correct its deteriorated condition, reduce maintenance cost and to better accommodate the Space Science activities performed in this building. This building is among the top energy consumers at the Center, and this proposed rehabilitation will reduce energy consumption.

5. Rehabilitation to Nondestructive Evaluation Laboratory.. 240,000

This project provides for the rehabilitation of approximately 9,000 square feet of the Nondestructive Evaluation Laboratory, hilding 4605. This facility houses X-ray equipment and other sophisticated testing apparatus for advancing the state-of-the-art of materials testing. This testing directly supports all center programs including the Material Control Office which approves all materials for use in space. The facility was constructed in 1966, has seen heavy use and has reached a point where normal maintenance cannot keep it in an acceptable state of repair. The work includes rework of HVAC air handlers and ducting; replacement of overhead lighting, ceiling tile, and deteriorated water piping; provision of an air lock; servicing of special doors to X-ray cells; provision for a temperature-controlled vault for film storage; additional radiation shielding; and installation of storm windows.

6. Rehabilitation and Modification for Radiation Effects Laboratory.. 270,000

This project provides for rehabilitating approximately 7,000 square feet of the Radiation Effects Laboratory located in hilding 4623. The work includes rehabilitating the HVAC system, replacement of overhead lighting, deteriorated water piping, valves and fixtures, and interior painting. Modifications will consist of providing men's and women's rest rooms, covered walk from rest rooms to rear of building, and upgrading electrical and mechanical services for new radiation testing equipment and appropriate safety and warning devices and replacement of existing deteriorated flat roof with new sloping roof.

This building serves as a radiations effects facility for the Material and Processes Laboratory. It houses sophisticated testing equipment for evaluating candidate materials for use in space. The building, constructed in 1960, is heavily used and is in need of major rehabilitation to correct its deteriorated and substandard conditions.

7. Rehabilitation to Pressurant Gas Manifold System 420,000

This project provides for the rehabilitation and upgrading of high-pressure gas manifolds to conform with the current ASME piping code. Failures and defects in the system are being found and it is necessary to make corrections at an increasing rate. This condition coupled with deterioration due to age, requires a major system-wide rehabilitation. Designated portions of the pressurant systems (gases, cryogenic, and industrial water) will be rehabilitated or replaced to maintain product purity and safe, efficient operation.

J. Michoud Assembly Facility (MAF)..... 1,850,000

1. Modifications to Industrial Waste Water Treatment Facility.. 420,000

This project increases the hydraulic capacity of the concentrate system of the waste treatment system. Accumulated experience during External Tank (ET) production indicates that the combined inputs of normal factory operations (chemical clean, demineralizers and backflush) exceed the capacity of the concentrate system and may eventually result in Environmental Protection Agency (EPA) permit violations. To correct this situation, a new pump, a lift station, a clarifier filter, related piping, valves, sensors and meters will be added to the existing waste treatment system.

2. Modifications to Barge Dock..... 490,000

This project is necessary to provide mooring capability for a fourth covered barge in support of ET shipping to launch sites. Capacity exists for mooring of three covered barges and one open barge tied to existing pilings. Because lateral wind force against a covered barge would up-root the pilings, it is necessary to install dolphins with more strength to accommodate a fourth covered barge. The work includes the installation of two mooring and berthing dolphins, timber fender piles, access walkways, and a shell roadway.

3. Rehabilitation of Heating, Ventilating, and Air-conditioning System.. 465,000

This project is necessary to restore operational reliability of the air handling units serving the Quality Assurance Laboratory, the Metrology Laboratory and the North Mezzanine located in enclosed areas within the Main Manufacturing Building 103. Nine units will be replaced and 10 units will be rehabilitated. The units, which are over 20 years old, are continuing maintenance problems. Some units are too deteriorated for effective rehabilitation and/or mechanically inadequate for the area served. This project will also replace the deteriorated fiberglass-lined ductwork over the clean room serving the propellant feedline umbilical assembly area. The fiberglass is losing its insulating qualities, and fragments are clogging the air system filters.

4. Modifications for Thermal Protection System (TPS) Material Storage.. 475,000

This project provides a 12,000 square foot storage area for ablator materials adjacent to the existing TPS Treatment and Weighing Facility in Building 130. The present mode of storing ablator raw materials in the main manufacturing building is undesirable because of possible silicone contamination and spillage. Also, the

distance between the treatment and weighing facility and the present storage area requires excessive handling. This project will provide a warehouse type environment, lighting and utilities and an unloading area for vendor shipments.

K. National Space Technology Laboratories (NSTL) 960,000

1. Modification to Cross-Country Valve ~~Pits~~..... 260,000

This project will raise all the valves of the high-pressure gas distribution system in four (4) pits from inside the pits to above grade. The solid valve pit covers will also be replaced with open grating for better ventilation. These modifications are necessary primarily for personnel safety. Possible leaks of inert gases which flow through the pipe and valves inside the enclosed pits could replace the breathing air and might cause asphyxiation of operations and maintenance personnel.

2. Rehabilitation of Liquid Oxygen Pumps at Space Shuttle Main Engine (SSME) Test Stand A-1 485,000

This project replaces the liquid oxygen pumps located on the six NASA LOX barges with two 3,000 gpm liquid oxygen pumps at the Space Shuttle Main Engine A-1 Test Stand. The land-based LOX delivery system will replace the 17-year-old worn-out pumps on the LOX barges and provide the capability to support extended duration test firings. Each of the six LOX barges have two 1,000 gpm pumps and one 200 gpm pump which, due to extensive use, require increasing maintenance and are unreliable. In addition, the existing barge control system is not compatible with the planned automated computer-controlled test operations. Work includes installation of pumps, drive motors, power and control systems, and foundations.

3. Rehabilitation for Program Support Communication Network.. 215,000

The Program Support Communication Network (PSCN) includes computer data transfer, voice and video teleconferencing, FTC communications and facsimile services between NSIL and other NASA centers. Approximately 800 square feet have been identified in the existing Communications Building No. 1201 to house PSCN facilities. Modifications will require the same environment as Automatic Data Process equipment. The system will include a cabling transmission medium to the telephone system, a local area network and a data buffer interface unit. In addition to system support utilities, the building modification will include a controlled access and standby power supply.

L. <u>Wallops Flight Facility</u> (F).....	2,615,000
1. Rehabilitation of SPANDAR Radar Operations Building (U-30).....	400,000

This project provides for the rehabilitation of the existing 4,400 square foot SPANDAR Radar Operations Building (U-30). The work includes the installation of a light weight water proof insulating panel system on the exterior of the facility; refurbishing the HVAC system, floors, ceilings, lights, exterior doors and windows; and upgrading the utility systems. Also included is the provision for increased radar operations capabilities. These capabilities will be utilized to research weather related atmospheric conditions through the use of radar techniques. The rehabilitation of the existing 25-year-old facility is necessary to upgrade lighting levels, reduce energy consumption and to generally restore the building systems to an acceptable level of operation. The work must be accomplished in the 1985 time frame to prevent additional corrosion-related building systems failures. This facility modification is required to house weather experimental electronic equipment; to provide space for experimenter's equipment and technical meetings; to provide space for technical support activities; and to permit the disposal of two trailers used for temporary technical space.

2. Rehabilitation of the Third Floor and Exterior of Building E-105.....	495,000
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This project provides for the demolition of existing partitions, and installation of new partitions, HVAC system, a fire protection system, and renovation of the toilet facilities on the third floor of Building E-105. Included is the installation of an exterior water resistant insulation system on the entire building, to include replacement of windows with smaller thermal units. Also included is the installation of an elevator. The work is necessary to reconfigure the third floor into efficient space for the expansion of the Sounding Rocket Program, provide adequate heating and air-conditioning from the central system, and to extend the fire protection system to the third floor. The exterior insulation system and replacement windows are necessary to stop water infiltration and preclude energy losses.

3. Rehabilitation of Building E-108.....	420,000
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Building E-108 houses the Instrument Engineering Branch which supports NASA's rocket programs. The building is over 30 years old and in very poor condition. Rehabilitation is required to stop water infiltration, reduce energy losses, provide more efficient operation of the HVAC systems, provide outside air to meet health standards, provide fire protection and handicapped access. This project will install an exterior water resistant insulation siding system, replace exterior windows with smaller thermal window units, replace exterior doors, install a fire detection and suppression system, modify the HVAC system, and reconfigure interior partitions.

4. Rehabilitation of Exterior of Building E-104..... 230,000

This project provides for the installation of an exterior water resistant insulation siding system, and the replacement of second and third floor windows with small thermal units on Building E-104. The existing deteriorated wood doors and windows will be replaced with metal systems to reduce maintenance. The walls leak when it rains and are not insulated; this results in high energy consumption for heating and cooling the facility. Building E-104 currently houses the NASA Management Education Center on the first floor. This activity will expand to the second and third floors in the near future and the space must be upgraded.

5. Rehabilitation of Optical Laboratory (E-2)..... 425,000

This project provides for the rehabilitation of the 8,000 square foot Optical Laboratory wing of Building E2. The work will include the reconfiguration of the laboratory as well as replacement of windows, exterior doors, deteriorated ceiling and floor coverings. Also the lighting, sprinkler, and HVAC systems will be rehabilitated and modified to conform to the revised laboratory layout as required. The Optical Laboratory was built in 1944 as a part of the Chincoteague Naval Air Station and has been in continuous operation since that time. The chemicals and fumes associated with the laboratory work have caused deterioration of walls, floors and ceilings which must be repaired or replaced to allow future operation. The reconfiguration of process and laboratory areas will produce a better flow for processing photographic materials.

6. Rehabilitation and Modification of Assembly Shop #1 (Y-15) 265,000

This project provides for the expansion of the shop area by 50 percent through the elimination of 1,100 square feet of office space. This includes the replacement of all electrical lighting fixtures, rehabilitation of the HVAC system, replacement of doors and windows, replacement of floor coverings with a chemically resistant type, repair of interior walls and ceilings, replacement of windows, painting of exterior surfaces, and replacement of discolored ceiling tiles. This 35 year old facility must be rehabilitated at this time to preserve and improve building systems, and to provide additional shop area for assembly of rocket and rocket components. This facility must support approximately 150 sounding rocket launches per year. The existing shop area must be modified to handle the larger sized rockets of up to 45 inches in diameter.

7. Rehabilitation and Modification of Runway Approaches..... 380,000

This project includes installing a Visual Approach and Slope Indication System for Runway 04-22 and 10-28; installing runway end identification lights for Runway 10-28, and a 100-square-foot addition to the Airport Lighting Vault, building C-94. The work also includes clearing of trees, and excavation, grading and stabilizing of the mounded area on the overrun of Runway 22, additional clearing of the safety zone on Runway

35, and the additional clearing of the safety zone in Runway 17. The instrument and lighting systems are required to provide visual glide slope indication for airport approaches and landings to increase operational safety. Additional vault space is needed for the new equipment. The tree clearing and earth moving is necessary to bring the Wallops Flight Facility Airport into conformance with the Federal Aviation Regulations, Part 77, "Objects Affecting Navigable Airspace".

M. Various Locations..... 750,000

1. Modifications for Waste Heat Utilization, Robledo, Spain 450,000

This project provides for installation of an absorption cooling system utilizing waste heat from the existing diesel engine generator sets replacing the individual direct-expansion units. Modifications include heat recovery units, absorption chillers, cooling towers, chilled water storage, and associated piping and heat exchangers for a central chilled water air-conditioning system. The existing systems are over 15 years old, inefficient, and are becoming less reliable. In addition to restoring reliability, the new system will reduce maintenance requirements and operating costs.

2. Rehabilitation and Modification Infrared Telescope Facility, Mauna Kea, Hawaii.. 300,000

This project provides for the rehabilitation and modification of the Infrared Telescope Facility, Mauna Kea, Hawaii. Work includes the replacement of 7,400 square feet of inadequate roofing with an insulated roofing system. Damaged interior walls and ceilings will be replaced. The original roof system has deteriorated rapidly due to the severe high altitudinal environment and has caused significant interior damage. Maintenance repairs to the roof have been ineffective. This work is urgently needed to prevent more costly damage to the computers and other scientific instruments in the facility.

MISCELLANEOUS PROJECTS LESS THAN \$150,000 EACH..... 445,000

TOTAL..... 25,000,000

FUTURE C of ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated \$25,000,000 to \$30,000,000 per year will be required for continuing rehabilitation and modification needs.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONSTRUCTION OF FACILITIES
FISCAL YEAR 1985 ESTIMATES
SUMMARY
MINOR CONSTRUCTION

<u>Summary of Project Amounts by Location:</u>	<u>Amount</u>	<u>Page No.</u>
Ames Research Center	490,000	CF 11-2
Dryden Flight Research Facility.. ..	200,000	CF 11-3
Jet Propulsion laboratory.....	610,000	CF 11-3
Kennedy Space Center	1,145,000	CF 11-4
Langley Research Center	655,000	CF 11-5
Lewis Research Center	460,000	CF 11-6
Marshall Space Flight Center.. ..	240,000	CF 11-7
National Space Technology Laboratories.....	245,000	CF 11-7
Wallops Flight Facility.. ..	670,000	CF 11-7
Various actions	<u>285,000</u>	CF 11-8
Total.....	<u><u>5,000,000</u></u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	Minor Construction of New Facilities and Additions to Existing Facilities at Various Locations, Not In Excess Of \$500,000 Per Project		
INSTALLATION:	Various Locations		
	FY 1985 CoF ESTIMATE:		\$5,009,000
	FY 1983:	\$3,750,000	FY 1984: \$3,800,000

COGNIZANT INSTALLATIONS/LOCATION OF PROJECT: Various Locations

COGNIZANT HEADQUARTERS OFFICE: Office of Management

SUMMARY PURPOSE AND SCOPE:

These resources will provide for minor facility construction at NASA field installations and Government-owned industrial plants supporting NASA activities. Each project included in this program is estimated to cost not more than \$500,000 and involves either the construction of new facilities or additions to facilities. The FY 1985 request of \$5,000,000 will improve the usefulness of NASA's physical plant by changing the utilization of or augmenting the capabilities of various facilities. Included in this request are those programmatic and institutional projects that are essential to the accomplishment of mission objectives.

PROJECT JUSTIFICATION:

The configuration of NASA's physical plant necessarily must respond to changes in utilization and adaptations required by changes in technology or in mission needs. Demands are generated by research, development, test, and similar activities. Specific justification for each minor construction project is provided under "PROJECT COST ESTIMATE."

PROJECT DESCRIPTION:

Included in the FY 1985 minor construction program are those facility projects for institutional or technical facility needs which could be fully identified at the time of submission of this budget estimate. Items of work totalling \$5,000,000 are included in this resource request and have been distilled from a list totalling over \$7,500,000. Projects were selected on the basis of the relative urgency of each item and the expected return on the investment. During the course of the year, rearrangement of priorities may require changes in some of the items to be accomplished. Such changes will be accommodated within the resources allocated.

These projects represent requirements that must be met in this time frame to support institutional needs and programmatic objectives. The following listing summarizes the cost distribution by category of work:

a. Utility Systems	215,000
b. General Purpose Buildings	1,730,000
c. Technical Buildings/Structures	3,055,000

PROJECT COST ESTIMATE:

A. <u>Ames Research Center (ARC)</u>	<u>490,000</u>
1. Construction of Addition to Rotorcraft Dynamic Calibration Facility (N-248C)	245,000

Ames conducts rotor systems research aircraft tests to develop and validate integrated rotor systems technology. The research is required to reduce rotocraft vibration, noise, and structural fatigue and to advance helicopter aerodynamics and structural dynamics technology. To obtain the in-flight load data, the research aircraft must undergo extensive calibration. The existing calibration facility cannot accommodate full-sized research helicopters. A 35- by 80-foot extension to the existing calibration facility is necessary to accommodate these and future research vehicles. Associated power and control systems are also required. The addition will be a pre-finished uninsulated metal building with metal roof and a 50-foot wide hangar door.

2. Construction of Compressor Blade Storage Facility.. ..	245,000
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Spare compressor blades are maintained for each wind tunnel to permit periodic replacement to minimize downtime when inspecting and refinishing the blades. Inspection is necessary after each 600 hours of operation. The blades are easily damaged during transportation, and thefts have occurred. An area near the inspection and

refinishing shop is required for secure storage of the blades before and after processing. The existing storage area is distant from the shop, cannot be adequately secured, and does not have environmental controls, a situation which can result in corrosion of the stored blades. This project will provide a 3,500-square-foot prefabricated insulated metal building adjacent to the refinishing shop. Sufficient environmental controls will be installed to inhibit blade corrosion.

B. <u>Dryden Flight Research Facility (DFR)</u>	200,000
1. Construction of Addition to Communications Building 4824.. ..	200,000

The aeronautical tracking capability at DFRF has been expanded to support simultaneous flights for NASA and DOD testing. Increased capability will also provide more reliable communications during the critical approach and landing phases of the Shuttle landings at DFRF. This project will provide the requisite space for the additional voice communications equipment associated with this expansion. The existing voice communications building will be expanded by 1,000 square feet; and a rooftop antenna mount for a high frequency directional antenna will be provided. The new antenna and communications equipment, provided by Space Flight Control and Data Communications funds, provides the additional voice capability required for supporting two simultaneous research flight missions.

C. <u>Jet Propulsion Laboratory (JPL)</u>	610,000
1. Construction of Addition to Analytical Instruments Laboratory.. ..	245,000

This project provides for the construction of a one story addition of approximately 1,200 square feet to the east side of the Analytical Instruments Laboratory, Building 121. The addition will be of concrete block construction, with a concrete floor and a metal roof deck. Work also includes a heating, ventilating and air-conditioning system, partitions, acoustic tile ceiling, electrical power, and lighting. The laboratory addition to Building 121 provides an infrared instrument measurement and calibration facility required to support Airborne Visual and Infrared Imaging Spectrometer and the Shuttle Imaging Spectrometer missions.

2. Construction of Assembly, Handling and Shipping Equipment Facility.. ..	240,000
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This project provides for the construction of a one story pre-engineered metal building of approximately 4,500 square feet at the northern portion of the Arroyo parking lot. The building will be of steel frame construction on a concrete slab with prefinished roofing and siding. Work includes a vehicle entrance door, ventilation, electrical power and lighting. The facility is required to provide a weather protected area for servicing and storage of spacecraft ground support equipment.

3. Construction of Addition to Building 249 125,000

This project provides for the construction of a 540-square-foot addition to the east side of Building 249. The addition will be of concrete block construction with a concrete floor slab and wood-framed roof to match the present building. Work includes partitions, restroom facilities, heating, ventilating, air-conditioning, electrical and lighting systems. This addition is required to provide adequate restroom facilities to accommodate the large groups touring JPL, including the handicapped. The existing facilities are too small to be modified to meet these requirements.

E. Kennedy Space Center (KSC) 1,145,000

1. Construct Hazardous Waste Storage Areas.. 160,000

This project is the continuation of a multi-year program to provide hazardous waste storage facilities at 13 KSC sites, and is necessary to comply with the Resource Conservation and Recovery Act so that KSC can retain its State of Florida Department of Environmental Regulation operating permit. To meet these environmental requirements each site must be provided with a monolithic concrete floor with center sump pit, metal shed-type roof, perimeter curb for leak containment, lightning protection and grounding, telephone, alarm system, eye wash, and safety shower. The sites are located in the KSC Industrial Area and at Launch Complex-39. Failure to comply with the environmental regulations would result in withdrawal of the operating permit for KSC hazardous waste generating sites with attendant adverse impacts on Shuttle operations.

2. Orbiter Processing Facility (OPF) CSE Holding/Staging Area..... 215,000

This project provides a storage and staging area immediately south of the OPF low bay for storage of Ground Support Equipment (GSE) used in processing Orbiters in flow. This GSE is now stored on roadways, OPF high bays and various other locations. A planned increase in Orbiter flows will render areas presently used for storage unsuitable, and as flight rates increase the situation will become worse. This project will provide suitable storage of approximately 12,240 square feet of concrete paved area which will be partially covered by a 3,750-square foot metal roof system. Adequate lighting will be provided for night operation.

3. Construct Addition to Fire Station #2, Launch Complex-39 (LC-39)..... 410,000

This project provides for the construction of a 50x60-foot preengineered metal building to be used for dormitories, restrooms, showers, kitchen and dining area sufficient for 22 male and 6 female firepersons and medics. The dormitory/food areas in the existing LC-39 station will be converted to classrooms, recreation and storage. The existing structure is inadequate for the additional apparatus and personnel requirements to

support the increase in Shuttle launches and landings. The present dormitory area does not meet the privacy needs of both male and female firepersons and is not sufficiently isolated from the equipment stalls to assure a 24-hour habitable environment .

4. Construct Addition to Hangar AM... 350,000

This project provides for an addition to Hangar AM at Cape Canaveral Air Force Station. This is one of the principal Payload Processing Facilities (PPF) used to support STS cargo operations dedicated to communications spacecraft (i.e., Telesat, Westar, SBS, TDRSS, STC). These spacecraft will constitute a major category of increased NASA payload traffic during the 1980's. The 40 X 110 X 40 foot addition will protect the payload processing environment during loading, unloading, and other events which require that the hangar high bay doors be opened. It will also serve as a holding and storage area for containers, packing material, and other items which now impact payload processing operations areas in the high bay.

- F. Langley Research Center (LaRC) 655,303

1. Construction of Addition to the Structures Research Laboratory (1148).. 413,000

This project provides for the construction of two two-story additions to the Structures Research Laboratory. The additions are to be located on the northwest and southwest corners of the facility and will consist of approximately 4,500 square feet that matches the existing interior office space designs and will include heating, ventilation, air-conditioning, plumbing, and electrical equipment. This project will provide needed office space for the Structural Mechanics, Structural Concepts and the Materials Process and Applications Branches. This addition is necessary due to the overcrowded conditions which exist in the current facility, providing less than 75 square feet per person.

2. Construction of Addition of Professional Services Building Annex (1153).. 245,000

This project provides for the construction of a 2,700-square-foot, two-story addition, which will be constructed with a reinforced concrete foundation and floor slabs, a structural steel frame, and a brick veneer wall. All necessary heating, ventilation, and air-conditioning, plumbing, lights, and power distribution will also be provided. The Office of Educational Programs has a major responsibility to manage the public mail function, a Spacemobile which travels over a five state area, an Aeronautics mobile which travels nationwide, a film library, and a teachers' resource facility. This entire operation is presently housed in temporary trailers which are inadequate to support these commitments. The new construction will provide a permanent location for the office and will improve operations.

G. Lewis Research Center (LeRC) 460,000

1. Construction of 480 Volt AC Power System at Engine Research Building Complex (5 and 23). 245,000

This project will provide 480 volts of AC power to the Engine Research Building (ERB) Complex (Buildings 5 and 23). The system will consist of three (3) new unit substations and secondary ties to existing unit Substations No. 11 and D6B1 in the basement of Buildings 5 and 23. One unit substation (No. 1) will be located adjacent to the Control Room in Building No. 5. The second unit substation (No. 2) will be located in the basement of Building 5. A third unit substation (No. 3) will be installed in a storage area in Building 23. Each of the new unit substations will consist of a 5 kV fused interrupter switch, 1000 kVA 2400V - 480V/277V dry type transformer and 480V secondary switchgear.

The Engine Research Building Complex electrical power system was originally designed to operate at 2400 volts or 120/208 volts. Most loads, in a modern industrial equipment environment like the ERB Complex, are best served from a 480 volt AC, 3 phase source. Serving such loads from either too high a voltage (2400 volts AC) or too low (120/208 volts) results in higher equipment costs and increased operating costs due to inefficient operation. This project will provide a 480 volt power source and replace two liquid filled power transformers.

2. Construction of Natural Gas Well..... 215,000

This project consists of drilling and developing one (1) natural gas well. The work includes site preparation, surveys, drilling to the Clinton Sandstone level approximately 2,700 feet below the surface, geophysical logging, hydraulic fracturing, installation of necessary casings and ground equipment and tying into the existing natural gas line. A recent study was undertaken to determine the potential for drilling one or more natural gas wells at Lewis Research Center. Of the potential gas-producing layers under the site, the Clinton Sandstone has the greatest potential. Based on the available data, a 60 percent success factor is assumed. Wells drilled to the Clinton Sandstone should be capable of Initial production of 50,000 cubic feet per day (50 MCFD) of natural gas. Based on the current cost for natural gas in Ohio, a 50 MCFD well is calculated to repay drilling and completion costs in approximately three years. Well drilling procedures will follow the guidelines of the Ohio oil and gas laws.

H. <u>Marshall Space Flight Center (MSFC)</u>	<u>240,000</u>
1. Addition to Communications Building	240,000

This project provides for a 2,500-square foot addition to the north east side of Communication Wlilding 4207 to accommodate the Agency's Program Support Communication Network (PSCN). Approximately 1,500 square feet will be raised floor for electronic equipment. The remaining space will be for equipment maintenance, hallways, and building services equipment. Temperature and humidity control, as well as connections to the existing no-fail power system will also be provided. The PSCN is part of the control center for the Agency's communication network using both hard lines and satellites in support of both institutional and programmatic communications requirements.

I. <u>National Space Technology Laboratories (NSTL)</u>	<u>245,000</u>
1. Construction of an Addition to the Central Program Support Computer System	245,000

This project provides for the construction of a 3,000-square-foot addition to Wlilding 1110, which houses the NSIL Central Program Support Computer System. Construction will consist of a concrete slab-on-grade, exterior walls of synthetic stucco, steel structural frame, built-up roofing over metal decking, interior partitions of gypsum board, and necessary plumbing, heating and air-conditioning, and electrical power to support the additional space and equipment. Future requirements of the Central Program Support Computer System include the necessity to add additional peripheral ADP equipment to support the increasing computational capability demands for automated financial management systems and office automation. Space is also required for future implementation of the automated program support communication (video conferencing) network. ADP support personnel presently located in remote temporary facilities and in hallways of Building 1110 will be relocated to the new building addition.

J. <u>Wallops Flight Facility (WFF)</u>	<u>670,000</u>
1. Addition to the Technical Service Building (F-10)	240,000

This project provides for the construction of a 3,600-square-foot, single-story addition to the Technical Service Wlilding (F-10). The addition will be complete with utility and HVAC systems. This technical addition is required to provide necessary space for increased test and evaluation operations in support of the sounding rocket program through 1988. The number of launches is expected to increase from 35 to approximately 48 per year.

2. Construction of Addition to Launch Pad 2..... 245,000

This project provides for the construction of an addition to Launch Pad No. 2 to house a relocated rocket launcher. The construction will consist of a concrete slab and base, blast shield, shelter rails, hardware, and necessary utilities. The launcher and its shelter building will be removed from Launch Pad "0", renovated as required, and installed at the new facility. This construction will permit the consolidation of launch operations at Launch Pad No. 2, and provide necessary separation between Wallops and the tenant (Navy) operations,

3. Construction of a Vehicle Service Facility.. 185,000

This project provides for the construction of 600-square-foot prefabricated building for vehicle washing, a fueling station and associated automotive storage space. The work includes the installation of utilities required for the car wash and two 5,000 gallon underground fuel tanks and pumps. Minimum automobile maintenance requires frequent washing to remove salt spray and other corrosion causing compounds. There is presently no efficient vehicle washing capability at WFF. Furthermore, the present auto fueling station at Building N-133 is inadequate to handle the present complement of vehicles and there is evidence that the 30-year-old gasoline storage tanks are leaking and should be replaced. Combining these two operations in a new building in the area of the maintenance shops will insure that essential maintenance is accomplished and will make better use of the limited personnel available.

K. Various Locations..... 285,000

1. Construction of Mobile Laser Facilities, Arequipa, Peru.. 165,000

This project provides for construction of Mobile Laser support facilities at the Smithsonian Astrophysical Observatory (SAO) site in Arequipa, Peru. The construction includes clearing and grading, paving, laser foundations, security fencing, utility services, and calibration target structures. These facilities will support mobile laser systems measurements of the earth's crustal movement in support of NASA's Crustal Dynamics Program.

2. Construction of Aircraft Shelter, Goldstone, California..... 120,000

This project provides for a 4,200 square foot shelter for protecting NASA/JPL aircraft from solar heating while parked at the Goldstone Lake airstrip in the Mojave Desert. The work also includes paving for access to the shelter and safety lighting. Daytime outdoor temperatures frequently exceed 115°F and cabin temperatures of parked aircraft in this environment have exceeded 160°F. Such high temperatures are detrimental

to the aircraft instrumentation, and the extreme heat in the aircraft is stressful to pilots and passengers upon boarding. This shelter will protect the aircraft from the desert insolation, prolonging aircraft equipment life and providing a reasonable cabin environment for personnel.

TOTAL..... 5,000,300

FUTURE C of F ESTIMATED FUNDING REQUIRED TO COMPLETE THIS PROJECT:

An estimated \$5,000,000 to \$7,000,000 per year will be required for the continuation of this minor construction program.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

SUMMARY

FACILITY PLANNING AND DESIGN

	<u>Amount</u>	<u>Page No.</u>
<u>Regular Requirements:</u>	<u>7,150,000</u>	
Master Planning	200,000	CF 12-2
Sustaining Engineering Support.. ..	550,000	CF 12-2
Preliminary Engineering Reports and Related Special Engineering Support.. .	2,350,000	CF 12-5
Final Design	4,050,000	CF 12-6
<u>Other Requirements:</u>	<u>4,850,000</u>	
Space Shuttle Facility Planning and Design.. ..	1,050,000	CF 12-7
Payload Facility Planning and Design.... ..	1, 150,000	CF 12-7
Altitude Wind Tunnel.....	2,650,000	CF 12-7
Total.....	<u>12,000,000</u>	

CONSTRUCTION OF FACILITIES

FISCAL YEAR 1985 ESTIMATES

PROJECT TITLE:	Facility Planning and Design		
	FY 1985 CoF ESTIMATE:	12,000,000	
FY 1983:	\$8,000,000	FY 1984:	\$8,600,000

The funds requested in this estimate are required to provide for the following advance planning and design activities related to facilities activities and projects:

- a. The accomplishment of necessary developnent and master planning for field installations and, where not otherwise provided for, the provision of continuing engineering support and special engineering management and other services.
- b. The preparation of preliminary engineering reports, cost estimates, and design and construction schedules .
- c. 'he preparation of final construction plans, specifications, and associated cost estimates and schedules required to implement construction projects.
- d. The accomplishment of facilities siting and other investigations, studies and reports.

Regular requirements encompass the basic purposes outlined above. The "other requirements," while also in support of "regular" purposes, cover those special needs related to large, complex projects or specific programs considered to represent high potential future construction requirements and for which early definition is essential. The large projects require more planning and longer lead time. Much of this planning must be completed prior to inclusion of the project in a budget request.

1. REGULAR REQUIREMENTS..... 7,150,090

A. Master Planning..... 200,000

Provides for the updating and further development of existing master plans for the field installations, including facility studies and site investigations. Documentation will define facility parameters within which subsequent engineering efforts will be based for future development. Provides for the documentation of existing plans where actions or deviations from previous plans have not been recorded for the various field installations.

Master plans at the various field installations are generally updated at 4-year intervals. Approximately one-fifth of the field installations are involved in any one fiscal year, keeping the level of effort relatively modest and constant. These plans provide for the orderly consideration of the allocation, proper arrangement, and efficient correlation of land areas and structures to serve the purpose of the various installations. Representative master planning activity candidates for FY 1984 are:

(1) Jet Propulsion Laboratory

An update of the facilities inventory base to include current utilization with emphasis on changes caused by recent facility planning, construction and modifications.

(2) Dryden Flight Research Facility

An update of the facilities inventory base to include current utilization with emphasis on changes caused by recent reorganizations and new facility planning, construction and modifications.

B. Sustaining Engineering Support..... 550,000

Provisions for facility studies and specific engineering support continue in importance as evidenced in recent years, and must be given high priority throughout FY 1985. These efforts are important due to cost trends in construction materials and fuels; the continuing importance of energy conservation and efficiency; and the operation and maintenance cost for the physical plant.

The following items are included in the FY 1985 requirements:

(1) Building Research Advisory Board Support

Covers annual support to the Federal Construction Council's (FCC) operations and provides for special studies that the Council will perform throughout FY 1985 to help advance the science and technology of Federal Government building and construction. The FCC is subordinate to the Advisory Board for the Built Environment, National Academy of Sciences, and its activities are supported by several Federal Agencies including NASA.

(2) Utilities Services/Rates Analysis

Provides resources for the support of utilities procurement and utilities control systems. This includes, but is not limited to, technical assistance, surveillance, and recommendations with regard to utility rates, contract negotiations, systems operations, and utilities control systems. Because of the great magnitude of energy costs, these services are an annual requirement and continue to be essential.

These resources enable the Agency to insure that fair and reasonable rates are charged under its major utility contracts. Essential and valuable technical assistance is provided to our field installations so that effective negotiations can be conducted with utility companies. Several major utility contracts per year require technical assistance as utility contracts are renewed throughout the Agency.

NASA's significant ongoing investment in utility control and management systems requires a high level of technical maintenance and support. The proper function and operation of the equipment are essential in order to realize the benefits. These resources provide the high technical capabilities needed to manage the system and insure proper operation and use.

These resources will provide for an updating of our system for forecasting utility costs and rates, so that better and more reliable utility budget requirements can be established. The accuracy and credibility of forecasts impact the Agency's planning for other resources.

These and other similar utility system services are provided for by the requested resources in order to ensure technical competence and properly manage this function.

(3) Facility Operation and Maintenance Analysis

Provides for continued engineering support for implementing improvements at NASA field installations relative to manpower utilization, work control systems, preventive maintenance, facilities management and reporting systems. Improvements will also involve techniques to identify where and how increases in productivity are possible. Included in this activity are field surveys to be conducted on a priority basis at selected NASA field installations to evaluate the effectiveness of the operations and maintenance management systems.

(4) Value Engineering ~~Cost~~ Validations and Analyses

Provides for engineering services to improve cost-effectiveness of facility projects by subjecting project design criteria, specifications and working drawings for specific material components and systems to a detailed independent review by engineering specialists in the particular area of involvement. Also provides services necessary to accurately predict and validate facility costs which will aid in resources planning for the various field installations.

(5) Facilities Utilization Analyses

Provides for the analyses of Agency-wide facilities utilization data covering: (1) office and other types of building space; (2) designated major technical facilities; and (3) special studies comparing the utilization of technical facilities which are similar in type or capability, such as wind tunnels. Such analyses provide for: (1) insights into and development of better methods of identifying underutilized facilities; (2) improved techniques to quantify level of facilities use; and, (3) actions to improve facilities utilization. Work provides for review of each installation's inventory data base in support of the facilities utilization program. Surveys are necessary to validate the reported data in relation to a specific problem or need, and to assist in providing a credible foundation for plans to improve the utilization of facilities.

(6) Environmental Studies

Provides for the identification of potential environmental problems or the quick resolution of any related controversies at the NASA field installations, These conditions may be brought about by:

- New federal, state and local environmental regulations, emission standards and environmental management planning programs that must be considered at various installations;

- Changes resulting from new or expanded program activities, new facilities, or major site expansions at NASA installations; and,
- Changes that take place in the external environmental conditions at NASA installations.

Early identification of potential environmental problems and quick resolution of these and related controversies at the installations are important. Project managers and facility planners require up-to-date, accurate information to comply with legal and regulatory requirements. For example, NASA will implement a multi-year, multi-phase, ~~agency-wide~~ program that will be responsive to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and its applications to federal agencies (E.O. 12088). The program **will** consist of initial assessment studies, confirmation and remedial action engineering investigations, as well as the execution of the most efficient and effective remedial actions, as required.

(7) Facility Project Implementation Handbook

Provides guidance to field installations on a standardized approach to facilities engineering. The Handbook is used as a source of basic policy and criteria for in-house engineering and work performed by architect-engineer firms. New criteria is continually being developed and/or revised. The Handbook must be modified on a progressive basis.

C. Preliminary Engineering Reports and Related Special Engineering Support.. 2,350,000

(1) Preliminary Engineering Reports (PER's) (1,850,000)

Preparation of PER's, investigations, and project studies related to proposed facility projects in the FY 1987 and FY 1988 Construction of Facilities programs are provided for by this estimate. These reports are required to permit the early and timely development of the most suitable project to meet the stated functional need. Reports provide basic data, cost estimates and schedules relating to future budgetary proposals. This request provides for PER; associated with proposed construction except as provided for in other requirements (paragraph 2) for Shuttle, Spacelab, and Payload initiatives.

The estimated cost of PER support for FY 1987 construction projects is \$1,150,000 which will permit updating of PERs for \$25-30 million in construction, and the development of new PERs for an additional \$40-45 million in projects.

An additional \$700,000 has been included in this line for the completion of new PER's for approximately \$30-35 million of construction projects which will be high priority candidates for inclusion in

the FY 1988 Construction of Facilities program. The activity associated with FY 1988 will be confined to the highest priority candidates.

(2) Related Special Engineering Support (500,000)

Investigations and project studies related to proposed facility projects to be included in the subsequent Construction of Facilities programs are provided for by this estimate. Such studies involve documentation and validation of "as built" conditions, survey/study of present condition of such items as roofing and cooling towers, utility plant condition and operational modes, analysis and support of environmental impact assessments and statements, and other like studies. These studies are required to allow for the timely development of projects to meet the stated functional needs and to provide basic data, cost estimates and schedules for related future budgetary proposals.

D. Final Design 4,050,000

The amount requested will provide for the preparation of designs, plans, drawings, and specifications necessary for the accomplishment of projects other than Space Shuttle, Spacelab, and Payloads and the Altitude Wind Tunnel initiatives. Amounts required for those efforts are included under other requirements (paragraph 2). Projects involved are planned for inclusion in the FY 1986 and FY 1987 programs. The goal is to obtain better facilities on line earlier at a lower cost.

The request will provide for final design work associated with construction proposed for the FY 1986 Program, estimated to cost \$55 to \$60 million, and for \$8 to \$12 million of high potential projects proposed for the FY 1987 program. The amount included for FY 1986 candidates and for residual requirements of this nature which have accumulated from prior years' final design activities is \$3,450,000. For FY 1987, \$600,000 is included and the supporting rationale is much the same as that set out in the PER estimate.

2. OTHER REQUIREMENTS 4,850,000

Other facilities planning and design requirements primarily associated with specific space programs characterized by large size, long planning cycle, and/or complexity of scope are included in this particular request. These programs require a level of planning effort and length of design time beyond the more routine facility projects. These requirements must be provided beyond the regular and most recurrent facility planning and design needs.

A. Space Shuttle Facility Planning and Design 1,050,000

These resources provide for early and progressive design, final drawings, specifications, and site investigations for future Space Shuttle facilities in order to insure the best design, good cost estimates and realistic construction schedules. The Shuttle operational era requirements include expansion of Kennedy Space Center vehicle processing facilities to meet an increasing launch rate, construction of operations personnel facilities, modifications to the launch complex support facilities and modifications at various locations for space engine enhancement and testing.

B. Payload Facility Planning and Design 1,150,000

Support of the operational phase of the STS payloads processing program will necessitate preparation of Preliminary Engineering Reports, facility site investigations, design of facility projects, and studies to determine facility capabilities. Included are Johnson Space Center facilities for payload operations control testing and crew simulation, expansion of Kennedy Space Center facilities to conduct cargo servicing and payload processing for the larger and more numerous payloads, as well as facility projects for logistics and maintenance of payloads and storage of associated flight and support equipment.

C. Altitude Wind Tunnel.. 2,650,000

This requirement is for studies, final design and technical engineering support related to the modifications of the Altitude Wind Tunnel at the **Lewis** Research Center. This effort will be first of a multi-year task. A preliminary engineering report is scheduled for development in FY 1984.

This project will provide for modification and upgrading of the existing, Altitude Wind Tunnel facilities so that full/large scale propulsion systems and icing research can be conducted under variable altitude and temperature conditions. This research will include areas of performance measurements, aeroelasticity, cooling, ice protection, and system integration on new and advanced propulsion systems for **VSTOL**, helicopter, and conventional aircraft. The total estimated project budget cost for the facility work is estimated to be in the \$120 million range.

Preliminary studies have determined the cost parameters and feasibility of modifying the 40-year old AWT facility for performing propulsion and icing research. Using the AWT structures and systems as a nucleus for the proposed new research facility appears to be technically and economically sound. These studies only established preliminary concepts and more effort is required to finalize the project scope.

• These resources will provide for definition of the project budget cost and will initiate design of the major facility work which involves rehabilitation of the existing tunnel, modification and upgrading of the refrigeration system, drive system, turning vanes, icing system, test sections, and control and data systems.

TOTAL.....

.12,090 ,000